THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XVIII. No. 435—21st YEAR.] LONDON, JUNE 22, 1869. [Subscription per Ann. 1l. 1s. in Advance / 1l. 8s. Credit.] With SUPPLEMENT, Price 1s. 4d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis by Dr. FYFE, M.D.:—
9746 cubic feet of gas per ton of coal.
26-candle gas.
13¼ cwt. coke per ton of coal.
N.B.—Ramsay's Cannel most resembles the Marquis of Lothian's Cannel, but superior as to coke.
RAMSAY'S PATENT CONDENSED COKE,
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828.
FIRE-BRICK WORKS, established 1804.
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The Fire Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article.
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Manufactories: DERWENTHAUGH, SWALWELL, and HEBBURN QUAY. Offices: BROAD CHARE, NEWCASTLE-UPON-TYNE. Address, G. H. RAMSAY.

GEORGE GLOVER & CO.,
Patentees of the Standard Gasometers for the Government, and of the
IMPROVED DRY GAS-METERS.
These Meters are warranted to measure correctly and not to vary, and have come into general use more rapidly than any Meters hitherto manufactured.

PARIS EXHIBITION, 1867.
THE TESTING-HOUSE REPORTS.
The Reports prepared for the Science and Art Department, under the direction of the Lords of the Council, detail the arrangements made for testing the gas apparatus exhibited. In the testing-house erected by the Special Committee appointed to further this object a gasholder was constructed by Mr. G. Glover, being a *fac simile* of that produced and patented by him in 1860, and deposited in the Exchequer, under the provisions of the Sales of Gas Act, and British manufacturers of gas apparatus were invited by advertisement, and by direct application, to forward worthy objects for exhibition. Mr. G. Glover was, however, the only manufacturer who sent Meters to be tested. The report states that, as "Mr. Glover is a manufacturer of Dry Meters only, no opportunity presented itself of comparing their accuracy with that of Wet Meters under various circumstances, but the perfection to which that maker has brought his Meters prevents the possibility of those extravagant errors which are well known to exist where Wet Meters are used."
Particulars and lists of prices forwarded on application to Ranelagh Works, Ranelagh Road, Pimlico, LONDON, S.W.; 15, Market Street, MANCHESTER; or 97, Boulevard de Magenta, PARIS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

FIRST PRIZE IN THE PARIS EXHIBITION.
JOHN RUSSELL AND CO.,
THE OLD TUBE WORKS,
CHURCH HILL, WEDNESBURY;
ALMA WORKS,
WALSALL, STAFFORDSHIRE;
and 69, UPPER THAMES STREET, LONDON,
Original Manufacturers of Wrought-Iron Gas Tubes and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest Orders may be executed in a few days.
Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanised Tubes, &c.
N.B. All Goods thoroughly Tested before sent out, and Warranted.

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WET AND DRY GAS-METER
AND
STREET-LAMP
MANUFACTURERS,
BELL BARN ROAD, BIRMINGHAM.
ESTABLISHED 1830.
All materials found for the alteration of Public Lamps for lighting with the Rod. Regulators with Lava Burners.

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NEAR NEWCASTLE-ON-TYNE.
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THE "LOTHIAN" CANNEL COALS.
These Cannels are extensively used in the Gas-Works of Edinburgh, where the illuminating power of the gas is the highest in Britain.
The yield per ton is 12,573 cubic feet; illuminating power 33·8 standard candles; coke per ton 1046 lbs.
Ports of Shipment, in the Firth of Forth.

BO'NESS CANNEL COALS.—This Cannel is largely used in gas-works where, in addition to high illuminating power, there exists a demand for superior Coke, it being the best Coke-producing Cannel of all Scottish Cannels. It yields about 11,000 cubic ft. of 25 standard candle gas per ton.
Ports of Shipment, either the Forth or the Clyde.
Apply to J. and W. ROMANS, 53, Frederick Street, EDINBURGH; & 1, Walbrook, Mansion House, LONDON.

NOTICE.
LESMAHAGO GAS OR CANNEL COAL.
JAMES FERGUSON & CO., Auchinheath COLLIERY, LESMAHAGO, and the NITSHILL & LESMAHAGO COAL COMPANY, AUCHINHEATH AND SOUTHFIELD COLLIERIES, LESMAHAGO, sole Proprietors and Producers of the above celebrated GAS COAL, beg to intimate to Gas Companies and other consumers that, having reason to suspect that Cannel or other Coal of very inferior quality, both as regards the quantity and illuminating power of the Gas, has frequently been mixed with and sold under the name of "Lesmahago," they have now appointed Messrs. JAMES LAWRIE & Co., of 63, Old Broad Street, LONDON, E.C., sole agents for England; and MESSRS. LA COUR & WATSON, of LEITH, sole agents for foreign markets; and, in order to prevent a recurrence of the frauds named, they request that all purchasers will send their orders through the above-named firms. Orders for other than the above-named markets may be forwarded direct to either of the Proprietors.
The Proprietors will, in future, use their own forms of bills of lading, and also issue certificates of origin, signed, as the case may be, either by JAMES FERGUSON & Co., or by the NITSHILL & LESMAHAGO COAL COMPANY; and they request all consumers purchasing Lesmahago Coal to demand such a certificate for each cargo, and to observe that it corresponds with the bill of lading.
Auchinheath, Lesmahago, March, 1868.

GEORGE GLOVER & CO.,
Patentees of the Standard Gasometers for the Government,
TWO MEDALS,

LONDON, 1862.
HAVE OBTAINED THE
HIGHEST
PRIZE
FOR
SILVER MEDAL,

PARIS, 1867.
IMPROVED DRY GAS-METERS AND GASOMETERS,
AT THE
PARIS EXHIBITION.
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.;
AND 127, BOULEVARD DE MAGENTA, PARIS.

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FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

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MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short notice.

SILVER MEDAL, PARIS EXHIBITION, 1867.

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ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

For Gas, Steam, Water, &c.

SOLE LICENSEES for the United Kingdom for the LAVENANT PATENT ENAMELLED TUBES & FITTINGS,

the Coating of which does not shell off, is a certain preservative from rust, and resists all effects of expansion and contraction.

LAP-WELDED IRON & HOMOGENEOUS METAL TUBES

For Locomotive, Marine, and Stationary Boilers.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools of all kinds.

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PATENTS FOR CHARGING AND DRAWING GAS-RETORTS,

WITH CHAMBERS FOR MOUTHS,

REQUIRING NO LUTING.

Gas Engineers are solicited to examine into the merits of this invention before erecting new or altering old retort-houses. It may be seen in action at the Alliance Gas Company's Works, Dublin, where its utility and economy will be clearly demonstrated. Although the saving in labour will be considerable, and quickly return any outlay of capital, there are other and important features strongly recommending its adoption at all gas-works, and which a gas engineer upon examination will at once appreciate.

The Directors of the Alliance Gas Company have kindly consented to give every facility to gentlemen desirous of seeing the invention in operation. Parties, therefore, about to visit Dublin will be so good as to send us their card, and we will furnish them with letters of introduction.

Drawings, &c., may be seen at our Office, and all details explained.

JOHN CHISHOLM, SON, & CO., 44, MARK LANE, E.C.

1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

CLASS II.

This Paint having been in general use over seven years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

IMPROVED CONSUMERS GAS-METERS,

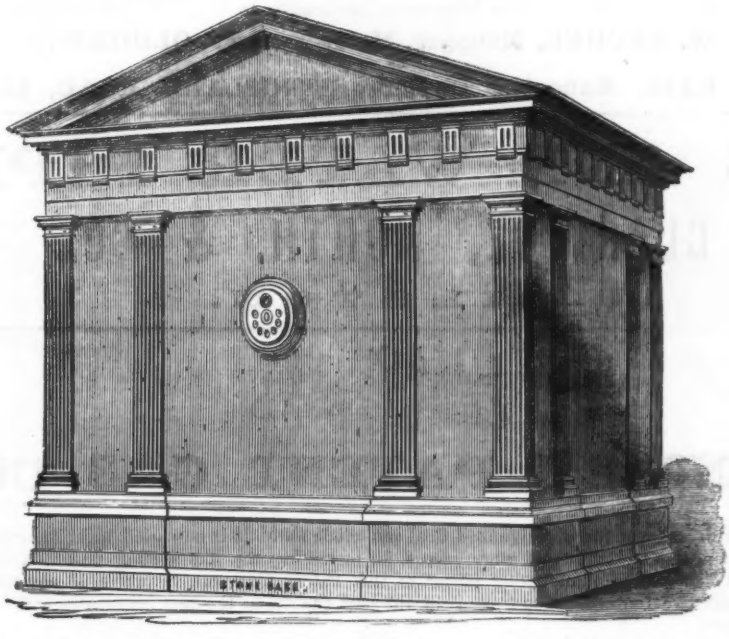
Of the Best Material and Workmanship, carefully adjusted to the requirements of the British Sales of Gas Act and Foreign Standards of Measures.

PATENT COMPENSATING GAS-METERS,

Which are uniform with the Ordinary Meters, and register with minute accuracy.

IMPROVED DRY GAS-METERS,

IN BEST TINNED IRON CASES.



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ALL SIZES, WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, EXHAUST-GOVERNORS, &c.

Home and Foreign Orders promptly attended to. Terms, &c., on application.

MESSRS. J. & J. BRADDOCK,

Tender their grateful acknowledgments for the past generous and extensive patronage conferred on their firm, and beg to assure their Friends, Gas Engineers, and Gas Companies generally, that every exertion will continue to be made to maintain the sterling quality of their work in every department.

Their ORDINARY METERS, WET and DRY, have now a demand over that of any other maker in the North of England; and their STATION-METERS stand unrivalled for Design, Sound Workmanship, and Efficiency.

All sizes of CONSUMERS METERS generally in Stock.

STATION-METERS, in round or square cases, on the Shortest Notice.

GEORGE NEWTON,

(Late Senior Partner of the Globe Meter-Works,)

UNION STREET WEST, OLDHAM,

MANUFACTURER OF

IMPROVED WET & DRY CONSUMERS GAS-METERS,

GAS STATION-METERS,

With all the Joints planed,

GOVERNORS, GAUGES, INDICATORS, EXHAUST GOVERNORS, &c.

TERMS, &c., ON APPLICATION.

THE GAS-METER COMPANY

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(Successors to CROLL, RAIT, and CO., LONDON, and WEST and GREGSON, OLDHAM.)

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At their Oldham Establishment, which has long possessed the reputation of supplying this description of apparatus of the most perfect construction and appropriate design.

CONSUMERS GAS-METERS IN CAST-IRON & TINNED SHEET-IRON CASES.

STREET GOVERNORS, PRESSURE and EXHAUST REGISTERS, TEST GASHOLDERS,

AND EXPERIMENTAL GAS APPARATUS GENERALLY.

For information, &c., apply to

W. ARCHER, Manager, Meter Factory, OLDHAM;

OR TO

GEORGE RAIT, Managing Director, KINGSLAND ROAD, LONDON.

GAS AND WATER PIPES.

CLARIDGE, NORTH, & CO.,

BILSTON.

M'KENZIE'S PATENT GAS COAL.

This Patent Gas Coal is a compound of Pulverized Coal and Shale Oil. It is now used most successfully by some of the London Gas Companies, and also in Dublin and other places, for increasing the illuminating power of the Gas, which it does at less cost than Cannel Coal. The illuminating power of this Patent Coal can be made of any strength required up to 35 candles, and is in all cases guaranteed. The Coke is of the best quality, as the best Newcastle and Sunderland Coals only are used in the manufacture.

This Patent Coal is shipped at Sunderland, where works for its manufacture have been erected.

Further particulars can be obtained from

W. W. JOBSON, 16, Fish Street Hill, LONDON; or

WALKER, BRUCE, & CO., Patent Gas-Coal Works, South Docks, SUNDERLAND.

EXTRACT *from the Inaugural Address of* THOMAS G. BARLOW, Esq., C.E., *President of the British Association of Gas Managers, at their Fifth Annual General Meeting, held in London on the 2nd of June,* 1868.

Gentlemen,—In considering the progress that has been made in the manufacture and distribution of Gas during the past year, the new inventions and new processes which have been adopted or tried with prospect of success, deserve to be specially noticed. Foremost among them is M'Kenzie's process for producing Gas of high illuminating power from small Coal, mixed with crude Shale Oil. The pressure which the Legislature has recently put on Gas Companies to raise the standard of illuminating power considerably above that obtainable from common Coal, has compelled most of them to use a certain proportion of Cannel Coal, at a heavy loss, and with a diminution in the value of the Coke. The advance in the price of Cannel Coal, consequent on the increased consumption, has stimulated inquiry to find a substitute for it; and this seems to have been accomplished by Mr. M'Kenzie, whose process has been successfully adopted on a large scale at the Alliance Gas-Works in Dublin. The small Coal is well mixed with the Oil, in the proportions varying from 10 to 30 gallons of Oil to one ton of Coals. This is effected by means of a mixing or grinding mill. The Compound material is then distilled in ordinary Gas Retorts of clay or iron, at a strong heat. I have recently witnessed an experiment on a mixture of Llantwit Small Coal shipped at Cardiff, and costing in Dublin 12s. 6d. per ton, with 5 per cent. of Broxburne Shale Oil, costing £5 10s. per ton, the produce of the distillation of one ton of which mixture was—

9750 cubic feet of Gas, 21·5 Candles illuminating power.
37 bushels of good hard, saleable Coke.
2 bushels of Breeze.
11 gallons of Tar.
15 gallons of Ammoniacal Liquor, of 5° Twaddle.

The cost of this mixture, including Royalty, was about 17s. per ton, against 24s. for Wigan Cannel, over which it has the advantage of at least 6s. per ton in the value of the Coke.

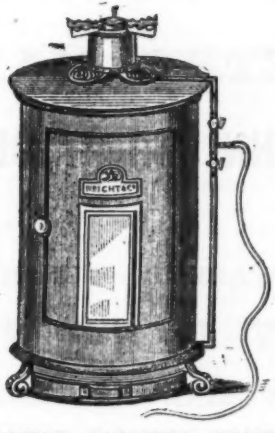
JOHN WRIGHT & COMPANY,

30, BROAD STREET, ISLINGTON, BIRMINGHAM.

JOHN WRIGHT & COMPANY'S

IMPROVED

GAS COOKING STOVES.



SQUARE COOKING STOVE, No. 65,

With Cast-iron Top and Bottom, Door, and Frame.

14 in. square, with Small Boiling Stove on top	£3 10 0
16 in. square, with one Large Boiling and Broiling Stove on top	4 5 0
18 in. square, with two Small Boiling Stoves and one Large Boiling and Broiling Stove on top (as drawing)	5 5 0

ROUND COOKING STOVE,

No. 68,

With Cast-iron Top and Bottom, and Glass Door.

11 inch diameter	£1 15 0
14 inch diameter	2 2 0
16 inch diameter	2 12 6
18 inch diameter	3 3 0

All the Boiling and Broiling Stoves are Atmospheric.

For Roasting, Broiling, Frying, Baking, Boiling, Stewing, or Preserving, either together or separately.

The advantages of Gas Cooking are—

Its portability and cleanliness—perfect and immediate control over the heat—it requires but little attention—there is no roasting or baking fire to make up—it is always ready—it keeps the kitchen and house cool—it is economical, even where gas is dear, as it is only alight while actually in use.

LACQUERED

AND

BRONZED.

3⅝ inch	1s. 4d. each.
4⅛ inch	1s. 6d. each.
4⅝ inch	1s. 9d. each.

If with Enamelled Top, White or Florentine, 6d. each extra.

WRIGHT'S

IMPROVED OPAL REFLECTOR.

7 inch White Opal	6s. 6d.
8½ inch „ „	8 6
10½ inch „ „	15 0
7 inch Green Opal	8 0
8½ inch „ „	10 6
10½ inch „ „	18 0

Shadowless Argand Burner for ditto, 2s. each.

WRIGHT'S

IMPROVED OPAL REFLECTOR,

WITH SMOKE CONSUMER.

Price 6s. 6d. each. Basins extra.

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IMPROVED

TEA KETTLE AND STAND,

TO HEAT BY GAS.

BEST PLANISHED TIN.

3 pint	10s. 6d. each.
5 pint	12 6 „

BRASS DITTO.

3 pint	17s. 6d. each.
5 pint	21 0 „

32½ per cent. Discount to the Trade.

THE

UNIVERSAL EXHIBITION OF PARIS,

1867.

SILVER MEDAL.

THOMAS CLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON,

HAVE BEEN AWARDED THE HIGHEST PRIZE FOR

DRY GAS-METERS,

BY THE IMPERIAL COMMISSIONERS FOR THE

UNIVERSAL EXHIBITION, 1867.

WILLIAM PARKINSON AND CO.

(SUCCESSORS TO SAMUEL CROSLEY),

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

PATENT IMPROVED WET METER.

W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sale of Gas Act.

"It is well known that n Meters constructed so that the valve will close when the water is drawn off to such a point as to render them 3 per cent. slow the lights are liable to be extinguished by the closing of the valve by a sudden increase of pressure. To meet this difficulty, Mr. Pinchbeck has invented an ingenious and simple arrangement by which the action is reversed, and any such increase of pressure, in his Meter, raises the value instead of depressing it. The fact of the improvement having been adopted by Messrs. W. Parkinson and Co. is a sufficient guarantee that it practically and effectually remedies the inconvenience it is designed to meet."—JOURNAL OF GAS LIGHTING.

PATENT IMPROVED DRY METER,

Which W. P. and Co. pledge themselves to manufacture with the same quality of materials and workmanship as in their Wet Meter, thereby giving Gas Companies and others the advantage of procuring a first-rate Dry as well as a Wet Meter, which, hitherto, they have been unable to do.

STATION-METERS AND GOVERNORS.

Which can be seen at all the London Gas-Works. Also Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

TEST GASHOLDERS, EXPERIMENTAL METERS, EXHAUSTER REGULATORS,

MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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The subscription to the JOURNAL is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders should be made payable at the Money-Order Office, London, to William B. King, 11, Bolt Court, Fleet Street, by whom the business department of the JOURNAL is conducted.

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Sixpence per line for every line additional.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 22, 1869.

Notes upon Passing Events.

THE great main drainage plan is not complete; it will not be complete until the low-level sewer has been carried through the City, either by costly tunnelling through the crumbling soil of the *débris* of ages, or by some economical arrangement with a City extension railway. But we know enough of the main drainage to conclude that it is at once a great success and a great failure. The success within the inhabited districts is all but perfect; the sewage is collected and carried away in the main channels provided, and the districts traversed are drained in a manner equalled by no other city. The men who planned and the men who executed the work are equally to be congratulated; but when we come to the outlet a very different story has to be told. A failure, under conditions so entirely without precedent, was so probable, that it would not be fair to blame any one for it. A series of elaborate experiments seemed to prove that if the daily sewage of London were poured out at the appointed outfall at the half tide it would be dissolved and swept away into the ocean without mischievous consequences, even to the desolate regions where the reservoirs with their floodgates were constructed. Experience has not realized this pleasant theory. The engineer of the Metropolitan Board of Works was naturally unwilling to admit any flaw in the gigantic plan he has so far carried out with glory and profit, and the Metropolitan Board, having exhausted their powers and finances, were equally unwilling to allow that the main drainage still required a large additional trunk canal to make it what it was intended to be. Evidence that cannot be neglected—for it comes from the navigators of the Thames—has shown that shoals of sewage, and still more formidable shoals of concreted sand, the produce of the stones of London ground to powder by iron hoofs and wheels, are daily accumulating, to the serious injury of the port of London. The Home Office have directed an investigation by one of their official engineers; the Conservators of the Thames are in possession of some very remarkable evidence. The Metropolitan Board have from the first been led to believe that the pouring of the sewage into the Thames was only a temporary expedient—that it would eventually be utilized on the land, not without benefit to the ratepayers. Crashes in the financial world have followed each other so thickly, and have been succeeded by such a stagnation in speculation, that our readers may easily have forgotten the grand scheme of Messrs. Napier and Hope, under which some two millions of money were to have been raised and expended in diverting the sewage canal from the Thames, and conveying it to the desolate regions of Maplin Sands, to be by these means converted into a series of fruitful pastures and gardens. Once carried to Maplin Sands, the difficulty of nuisance would be extinguished, for the porous sandy expanse could absorb and deodorize any imaginable quantity of sewage. Better still, the sands afforded the very easiest medium for its utilization. Unfortunately, while the Board was driving a hard bargain with Messrs. Napier and Hope, and successfully opposing their first Bill, the credit of public companies absolutely disappeared. The great Metropolitan Sewage Company for the reclamation of Maplin Sands has never got farther than an experimental farm near Barking. There enough has been done to prove that London sewage is a most valuable auxiliary in cultivating a great variety of crops, and that a supply, when wanted, at something like a penny a ton, would be a good investment. Unfortunately, the means of the Metropolitan Sewage Company seem unequal to do more than experiment on their 200 acre farm. This farm has shown how sewage may be profitably applied in very different ways to different crops. Artificial grass, especially Italian rye-grass, can take sewage as long as the temperature of the season allows it to grow. Mangold, potatoes, and strawberries benefit most in times when rain is needed—when first sown. Cereals can rarely bear irrigation, and must take their dose through soil saturated before sowing-time or after root crops. The experiments have been made in a sufficient acreage, and for a sufficient number of seasons, to afford a safe guide for sewage calculation. But it is now quite plain that private enterprise, which always stood aloof from agricultural joint-stock speculations, will not grapple with the metropolitan sewage difficulty. If the navigation of the Thames be threatened, the Metropolitan Board or the Government must come to the reserve, and either, by extending the main drainage to Maplin Sands, be in a position to supply it to a reclamation company, or, after the precedent of the Indian railways, enable a company to complete the work by guaranteeing a certain rate of interest—say 4 per cent.—on certain reproductive terms. We are now, as regards the contents of the main drainage, driven into a corner. Either the Thames will be choked up and poisoned, or the means must be found for carrying it where it may be utilized, and cannot be a nuisance.

The Education Bill (No. 1) has passed through the House of Commons without further damage than that it received in committee, where a compromise was effected between the out-and-out reformers and the advocates of vested interests. As the Bill came from the committee it had the advantage of the parentage of a strong Government; therefore the emasculating amendments, supported by such Liberals as Mr. Locke, of Southwark, and Mr. T. Chambers, of Marylebone, were defeated. The real danger was in committee. It may be doubted whether, if the Bill had been introduced by a weak Conservative Government, it would not have come out in a more thorough shape than as the child of a Cabinet of Reformers.

The town of Bedford is positively gorged with charity money. The Bedford Charity Trustees administer money enough to provide materials for the education of the middle class and the poorer class of the whole county, and more. But Bedford is represented by two Liberals, one of whom is in the Government, and is a connexion of the great house of Russell; the other, Mr. Howard, is a convert from the Conservative ranks. The Bedford charities would have been dealt with, we suspect, in a much more reforming spirit, had the borough been represented by two Conservatives. In spite of Mr. Locke and Mr. Chambers, and the silent influence of the members for the City of London, the City schools are not to be excepted from the operation of the Bill, neither are the schools attached to ecclesiastical corporations. All the fruits of so great a change depend on a judicious selection of the commissioners for working the machinery. We wait with anxiety for their names. If they do their duties well, a general reform would be amazingly simplified by making them also the Charity Commissioners. In the meantime, the restless intellectual activity of Sir Charles Trevelyan, stale-mated as to the law courts by the Chancellor of the Exchequer, has been directed to the City charities, with pungent effect. While devoted clergy and other philanthropists have been making superhuman exertions to support ragged and other schools in the east end of London, the City proper is positively festering with misappropriated charities. Paupers are raised, like orchids, at from 10s. to 30s. a week, while churches, which would otherwise be empty, are kept alive by beadles of prize-ox fatness, and curates actively engaged in assisting incumbents to do nothing. The sketch of the church in Cornhill, which has been improved with stained glass into such a "dim religious light" that gas is required for afternoon service, is delightful. Sir Charles's dignity prevented him from relating that this ecclesiastical obscurity has rendered this particular church the favourite place of assignation for the amorous clerks of the neighbourhood. We have only to look at the degrading ignorance of Spitalfields and Poplar on one side, and on the wasted charitable funds within the City bounds, to feel that there is room for a very vigorous City reformer. Thus, there is £111,000 accumulations to relieve poor slaves, while St. Clement's Danes has £5000 a year arising from an original investment by its churchwardens of £100. The fact is, that while the value of charities has increased, the poor, for whom these funds were intended, have disappeared, except were specially attracted by doles. "One parish has been nearly "obliterated by the Post-Office, another has been entirely "swallowed up by the Bank and Royal Exchange, another has "been nearly extinguished by Christ's Hospital." In a word, the City Common Council, who pride themselves on their Protestantism and their liberal pclitics, are the protectors of superstitious uses, and the supporters of most corrupt corporations. The following is a fine sample of City charities:—

By a will dated the 16th of January, 1503, the following bequest was made to the parish of St. Edmund the King and Martyr:—"20s. in bread among poor parishioners of the parish, and 20s. in coal; 5s. among the priests and clerks, for certain yearly services in the church (superstitious uses); 5s. in alms to the poor; each of the wardens, 6s. 8d.; £7 to each of two chaplains nominated by the trustees. Residue for the repair and rebuilding of the property of the City." In 1868 the annual income had increased to £1421 2s. 4d., and the expenditure was as follows:—

Rector, for Sunday evening service	£195	6	6
Clerk, pew-opener, verger, lighting and warming church	204	0	0
To 23 poor parishioners, in money	497	0	0
To 23 same poor persons, in clothing, bread, coals, and meat*	150	0	0
Meat for poor	32	0	0
Repairs	97	0	0
	£980	0	0

The churchwardens are sometimes driven to grotesque modes of disposing of charity money. The following table shows the expenditure for three years previous to 1868 of Thomas Waade's charity, "for putting out poor people to some good calling," in the parish of Christ Church, Newgate:—

Year.	Gross Income.	Apprenticing.	Repairs and Rates.	Management.
1865	£383 17 0	£16 0 0	£145 18 11	£6 10 0
1866	355 10 2	52 0 0	167 15 3	12 0 0
1867	363 3 6	24 0 0	144 7 8	8 0 0

The large item for repairs is accounted for by the charity possessing some cottage property at Tooting, in the systematic improvement of which they spend the income they have nothing else to do with. Christ Church is the parish which has been extruded by the growth of Christ's Hospital.

How long will such abuses last? How soon will disendowment be applied to City charities? Why, just as long as Parliament is occupied with imperial reforms and abuses. The City's turn must come.

Mr. Charles Buxton, taking up the scheme hatched by Mr. Beal, and fostered by Mr. John Stuart Mill, brought in a Bill last week for creating ten municipalities in the metropolis, with each its mayor, aldermen, common councilmen, and officers, to be under a sort of federal City Parliament, composed of the Lord Mayor and 135 common councilmen and aldermen. But the details of the scheme met no favour, and it was withdrawn, but not until Mr. Bruce had undertaken to bring in a Bill dealing with the whole subject, if the Ministers survived another session of Parliament. At present, and for two sessions, as he candidly admitted, the Government have their hands full. But he did not give any encouragement to the idea of a multiplication of mayors and common councils, because, as he justly observed, they could not have sufficiently important duties to perform when those duties were subtracted which must be centralized. So far from favouring the idea of a division of the police into ten districts, he roundly expressed his opinion that one central authority over the whole police of the metropolis was essential for good government. Every one who has not been corrupted by City associations will agree with him. Mr. Bruce pointed rather to a reduction of the number of the existing local bodies. It is to be hoped that the numbers of each body will be reduced, so as to add to the administrative, and decrease the debating element. The lawyers clerks, and other orators, who formerly found their audiences over pots and pipes at pot-houses, now sit on luxurious chairs and harangue the vestry parliaments. If Mr. Bruce can really make local administration a matter of serious business, and, by a recasting of the Corporation of London, create a central power where there will be less froth and more substance, he will be indeed the benefactor of the metropolis. The Corporation of London cannot, and ought not to be passed over in any scheme for the municipal government of the first city of the empire, for it must get rid of its cumbrous machinery and trappings, no more suited to modern local government than mediæval armour to a modern army. If some municipal reformer would take up the files of the *City Press* for a year, and give a summary of the time occupied in speeches of self-laudation committees, and reports that led to nothing but luncheons, and analyze the curious division of labour, enforced by jealousy, in order to compel a division of honours, he would show a minute halfpenny worth of bread to gallons of sack. Thus we learn, from the report of the last meeting of the Common Council, that there is a contest going on as to whether Holborn Viaduct and Blackfriars Bridge shall be opened by one ceremony or two, at an expense of £1000 or £2500. The real difficulty to be settled by the tact of the Lord Mayor is, that the two chairmen and committees are jealous lest the viaduct or the bridge should have the greater share of honour and patronage; and in this sort of childish stuff the time of men of business is wasted. We may safely predict that, at any rate, the Common Council will agree to have one, if not two "feeds;" but, at the very same meeting, it was decided that it was impossible to find a place for the City Library and Museum, to be also available for public receptions; and this when such vast sums are expended on lath and canvas temporary arrangements. In the same spirit Mr. Bedford was met when he endeavoured to induce the Corporation to set a good example by erecting, on the site of 188 houses of the most wretched description, improved dwellings for the working classes. He argued that if the Corporation led the way, the Goldsmiths Company, the Fishmongers Company, and other companies, which now spend their revenues in giving sumptuous entertainments to each other and to a few distinguished visitors, might follow in the healthy track. The Corporation decided to leave the work to Mr. Peabody, or to private enterprise, which is the same thing as leaving it alone. The Holborn Viaduct and Blackfriars Bridge will give the Corporation political capital for a time, but will not serve them much when they have been open long enough to assume an old air; and that, thanks to our climate, a very few years will effect. It seems that the income of the Corporation is deficient by about £5000 a year; they are now losing heavily on Leadenhall Market (why is it not closed?), Newgate, and the New Meat Market. Under these circumstances, a loan of half a million is about to be contracted. The Corporation's credit is excellent; when that fails, a change is at hand. The reform of the Corporation of London will not, however, be advanced by such extraordinary statements, on the subject of water supply and paving, as appeared last week in that able and usually well-informed paper, the *Echo*. The writer in the *Echo* would have us to understand that a truly representative Common Council would improve matters of

* 23 ÷ £679 = £29 18s. About £29 10s. to each poor person. The one who receives most has upwards of £60.

detail management which are now better done in London than in Manchester. The much-vaunted water supply of Manchester notoriously failed last summer. While London was amply supplied from the Thames, the people of Manchester were put on short allowance of water of a most unpleasant quality. The metropolis was supplied with water by companies which were established nearly a hundred years before Manchester attempted to supersede water-carts selling at the rate of a halfpenny per pail, and last summer proved that the river source is the surest and the best. So, too, as to gas supply, it may be a question now whether a newly formed Corporation might not profitably purchase or establish water and gas works; but the companies which supply London were established before the idea of a manufacturing municipal Corporation had taken root. They took the risks; they taught the rest of the world; and they say now, with the successors of Sir Hugh Myddelton, "If you want our works, treat us as railway companies treat "landowners—buy up our property." The observations about paving show not only want of practical knowlege, but of observation. The writer fancies that the mud of London streets spews from between the granite stones—granite all laid on a bed of concrete! The mud on the road, like the mud on the pavement, comes with the traffic, on a rainy day, on wheels and hoofs. The traffic of London is so enormous, that it rapidly destroys the hardest materials. Any comparison with Manchester or any other city is valueless. Indeed, it is in sewers, in paving, in carrying out sanitary measures in poor neighbourhoods, and all the work under the direction of the officer of health and the engineer, that the City of London most excels Manchester. If other work were done as completely and as vigorously, London would be a model city. We recommend the *Echo* to send a competent person to survey and report on the operations of the Commissioners of Sewers. before praising Manchester for its failings.

A discussion in the House of Commons the other night on a Bill for punishing the adulteration of seeds afforded one more example of the difficulty of finding a remedy for an acknowledged evil. A trade is carried on in selling rubbish for seed. A farmer buys what he believes to be seed, and he loses not only his money but his crops. His remedy by action is expensive and circuitous. The happy people who never have a doubt would propose a summary and criminal process for punishing the fraudulent seed-seller. But there is another side to the question. Although there is extensive dealing in rubbish sold for seeds, the best seeds, under unfavourable circumstances, fail to germinate. Mr. Bright, who, putting politics and the prejudices of his race on one side, is by far the most able and "thorough" man who has presided at the Board of Trade in our time, said, in his exhaustive speech on the subject—

> This very day I have received a letter from the oldest firm of seedsmen in London, that is the firm of Minier, Nash, and Nash. Nobody will say that they are not the most respectable house in the trade. They have been in the same premises for 200 years. They say: "It is well known that seeds often fail in growth from causes beyond the merchant's control. One man will get a good crop, and another almost a failure, from the same bulk of seed. It would, therefore, be a most intolerable nuisance that a party could go before a magistrate and make a charge that we had sold him adulterated seed, leaving us to make out our case to the contrary, which would be an utter impossibility, seeing that the seed might have gone through a dozen hands from the time it left the grower in Germany or elsewhere."

This statement does not prove that there should be no legislation, but that to punish without persecuting innocent men is not so easy as it seems off-hand. The Bill has been referred to a select committee.

Circular to Gas Companies.

The fate of the opposed gas Bills of the session to which the most interest was attached is now either positively known or may be confidently predicted. The Aberdare Gas Company have failed in their attempt to throw out, in the committee of the House of Commons, the Bill of the proposed new competing company, but they have so far succeeded as to carry an amendment to the effect that, if they elect to sell their works to the new company, they will be entitled to compensation on the basis of the sale being compulsory. The Maryport Town and Harbour Gas Company have also carried their Bill through the committee of the House of Lords, notwithstanding the renewed opposition of the trustees of the dock and harbour, who strongly objected to that clause of the Bill which repeals the power given to them by their Act of 1868 to supply gas to private consumers in competition with the gas company. That decision will prove a "severe blow and great discouragement" to Mr. George Flintoff, and to those who have been induced by him to push on their works with the view of successfully competing with the old company, whose undertaking they had been negotiating to purchase. The Act which they obtained somewhat surreptitiously in the last session, when the gas company were thrown off their guard, has thus proved but a barren triumph, for they are left with the new works constructed by Mr. Flintoff "on a plan totally different from "anything that had been done before," at a cost of £8000, with the power to supply only the town and district lamps, the harbour and lighthouses, the lighting of which has hitherto proved unremunerative to the company. There seems to be a fatality impending over Mr. Flintoff's endeavours to benefit the public by cheapening the supply of gas, which, even when most promising, somehow end disastrously to those who have been seduced by his persuasive eloquence to adopt his plans. The superiority of the new works constructed on his improved principle has not a fair chance of being fully appreciated, while the cost of their construction, and the parliamentary expenses incurred in the attempts to bring them into full operation, will make the trustees rue the day when they were misled by the phantasm of cheap gas. The Glasgow Corporation Gas-Works Purchase Bill has passed the committees of both Houses, the maximum price being fixed at 4s. 7d. per 1000 feet for 25-candle gas, without meter-rent. A clause was introduced in the Bill giving power to pension off such officers of the gas companies whose services may not be required by the Corporation.

The Imperial and the South Metropolitan Gas Companies Bills are threatened with further opposition, in the House of Lords, from the Metropolitan Board of Works. The petition against the Bill of the Imperial Company comprises nearly all the points of objection that were raised to the Bill in the committee of the Commons. It states that the Board are entrusted by Parliament with large and important functions in and over the metropolis; that by the Chartered Gas Company's Bill of last session the Board were constituted an authority for carrying into effect the provisions of the City of London Gas Act throughout the extensive district of that company situated beyond the limits of the City of London, and that they are consequently injuriously affected by various provisions of the Bill. Among the provisions to which they object are those authorizing the raising of so large an amount of additional capital; the acquirement of more lands to erect additional works; the purchase of collier ships; the power to work railway trucks; and the perpetuation of the reserve-fund. The petitioners allege that the Bill is insufficient and inadequate to meet the just requirements of the gas consumers of the metropolis, inasmuch as it departs in many essential particulars from the provisions of the City of London Gas Act, to which it should be made to conform as a condition of granting power to raise any further capital. The petitioners then proceed to submit that the illuminating power of the gas should be 16 candles; that an insurance-fund should be substituted for the reserve-fund; that the saving to be effected by amalgamation should be taken into consideration by the commissioners to be appointed for regulating the illuminating power and the price after 1870; that more effectual means should be adopted to prevent interference with the sewers; that the amount of the proposed additional capital is far too great; and that it is not expedient to confer on the company any powers beyond what may be absolutely necessary to enable them to fulfil their obligations as to lighting their district with gas. The extraordinary reason is assigned by the Metropolitan Board why the Imperial Company should supply gas on terms at least equally favourable to the gas consumers as the Chartered Company—that the district of the latter is to a great extent already covered with buildings, whereas the district of the Imperial Company comprises extensive areas not yet occupied, but where the consumption of gas is rapidly increasing every year! We may venture to predict that such reasoning will not avail in a committee of the House of Lords, in inducing them either to raise the standard of illuminating power, or to diminish the amount of capital required by the company.

While the Metropolitan Board of Works are thus anxious to make the Imperial Gas Company conform to the Chartered Company's model Act, the latter are endeavouring to defer the time when they shall be subject to its provisions, and have applied to Parliament for leave to introduce a Bill to postpone

the operation of the Act, so far as regards the price and illuminating power, from the 1st of January, 1870, to the following year, and the Board have presented a petition against granting the request. It is not very probable, however, that the Standing Order Committee will so far depart from the ordinary practice as to suspend the Standing Order in favour of such a Bill.

The protracted proceedings before the arbitrators in the matter of the commissioners of Dundee and the Dundee (Old) Gas Company were resumed on the 25th of May, and concluded on the 10th inst. When the umpire has viewed the works, the arbitrators will have to make their award; and in the event of their disagreeing, that duty will devolve on the umpire. On one side the value of the undertaking is estimated as equivalent to annuities ranging from £14,007 to £14,725; while according to the witnesses for the commissioners, annuities ranging from £3600 to £4550 would fully represent the value. With such wide differences there is ample scope for adjustment, and when that question is settled the arbitration on the claims of the new Dundee Gas Company will shortly follow.

The notorious Higgs has been made a bankrupt, and the claims of his creditors afford some notion of the extravagant manner in which he had been living while receiving a salary of only £150 a year. The petitioning creditor is called a "re-staurateur," who claims £600. A surgeon put in a claim for £1137 for medical attendance over a period of eight years, there having been several payments on account. The sum of £1784 was claimed by a building contractor, on a contract for £11,000, and the petitioning creditor's debt includes a claim of £300 for money borrowed by Higgs the morning before he absconded. It appears, therefore, that he cannot have carried off with him any large amount of cash, and that the £71,000 of which he defrauded the Great Central Gas Company was squandered as quickly as it was taken. The gas company tendered a claim for £71,214 2s. 2d., which amount, it appeared, from the investigation of the company's books, had been applied by Higgs to his own use, instead of being properly accounted for. The object of preferring the claim was stated to be that no dividend might be declared until Higgs had been apprehended and tried. It was contended on behalf of the petitioning creditor that the company ought to show, by the production of their books and vouchers, that they had any claim at all. In support of the claim an affidavit of the secretary was produced, stating that he had paid cheques to Higgs to the amount of £1028, for the purpose of discharging debts due by the company, which he had paid to his own account at the bank, and that the aggregate of Higgs's fraudulent appropriations amounted to the sum claimed. The Registrar said that before the company could prefer a formal claim they might be bound first to prosecute the offender, and to show that they had not contributed to the loss by their own neglect; but, as they only asked that a claim might be allowed, no injury could possibly arise, as it would be only a notice to the creditors. The total debts owing by Higgs, apart from the claim of the Great Gentral Gas Company, were stated to be about £10,000, and there are assets to nearly an equal amount. The liberal allowance of £5 a week out of the assets was made to the bankrupt for the support of himself and family. We understand that seven officers of the company have been discharged for alleged negligence connected with Higgs's frauds, including among them some of the oldest in the company's service.

The second report of the Gas Referees to the Board of Trade has just been issued. It is dated May 3, and commences with the statement that all the testing-stations required under the City of London Gas Act (1868) are nearly completed, and would be certified in the course of the following week. We believe, however, that the testings have not yet been begun at any one of them. With regard to the apparatus supplied for estimating the illuminating power, the report informs us that the referees have caused to be fitted up improved forms of Bunsen's photometer, which means, we believe, in all cases but one, Mr. Evans's photometer. It is afterwards remarked, with more truth than originality, that our existing system of photometry is very defective; and it is added that "a slight variation "in the sensibility of the eye of the gas examiner may easily "make a difference of half a candle in his recorded testings." That some liability to "personal error" exists in our present system of photometry there can be no doubt; but, inasmuch as it is as likely to be in one direction as in the other, it is a matter of no great consequence. As a matter of fact, it is found that two examiners, equally competent and equally careful, usually arrive at results which differ by very much less than half a candle; and what variation in the sensibility of the eye of an individual examiner will lead him so far astray, neither the referees nor any one else has the smallest knowledge. Since, however, they assert this variability in the eye, and also feel it incumbent on them to discover, if possible, some better means of measuring the "illuminating power," it is to be expected that they will direct their energies to the discovery of some means in which the human eye plays no part, and so altogether exclude that source of error.

The referees proceed to relate their proceedings with regard to the selection of a standard burner. They advertised their willingness to examine the merits of any gas-burners that might be submitted to them, and made a collection of all in common use, and then proceeded to compare them with Sugg's Letheby burner. They found, as might be expected, a wonderful diversity in the results; and they very properly called public attention to the great loss sustained by the use of defective burners. This is a point which can hardly be too strongly insisted upon, for there can be no doubt that the complaints against gas are most frequently due to the faulty arrangements of the consumer. The consumer, however, is not to blame; he is in the hands of the manufacturers of gas apparatus, and they, the referees say, "are, with one or two exceptions, wholly ignorant "of the principles which regulate the development of light "from gas." Two newspaper offices were visited by the referees, and they found that the burners chiefly used gave only one-half the illuminating power of the gas supplied and paid for. But, setting aside the bad burners, the referees tested the better kinds invented for common gas, and arrived at the following values for them:—

		Illum. Power.
Argands.		
Sugg's Letheby (for 14-candle gas)	15 holes.	100
„ „ (for 12-candle gas)	15 „	100
Sugg's Consumer's	30 „	95
The Birmingham Standard	15 „	99
Leoni's Standard Adamas	15 „	100
„ Albert Crutch	40 „	100
The French Bengel	30 „	112
„ „	20 „	112
Bat's-wings.		
Bronner's Patent, Steatite Top		99
Common, No. 6, Iron		89
Fishtails.		
Leoni's Economizer, No. 8		89·5
Strode's, No. 6		89
Sugg's Steatite, No. 6		88

It should have been said that the consumption of gas in these experiments was at the statutory rate of 5 feet per hour. Fishtails necessarily came out the lowest, and the referees point out that these burners, the most commonly used, are really the worst for ordinary gas. Their cheapness recommends them to the consumer, who loses in light, and consequent waste of gas, what he saves in the cost of the burner. The above-named burners are not to be taken as specimens of those in common use. Three fishtail burners purchased at random, the referees tell us, were found to give respectively only 27, 24, and 23 per cent. of light, compared with the standard burner. The new standard burner, as our readers know, is Sugg's "London" Argand, the illuminating power of which, compared with the former standard—Sugg's Letheby—is as 116 to 100. This burner is unquestionably superior to any hitherto made, and is very properly adopted as the standard. By so doing the referees plainly tell the public what is the best burner to use, and, if the public do not choose to adopt it, they have no right to charge the gas companies with supplying an inferior gas. The referees hint that the comparatively low price of this burner has somewhat influenced them in making their choice; but it is added that the question of price is one of subordinate importance, for the greatest difference in price of burners would be compensated in a single year—either by using less gas than before, or, when more light is needed, by obtaining the required additional light without an increased consumption of gas. "In many large "establishments," it is innocently added, "the great object is "to obtain as much light as possible, and in such establish-"ments there would be no diminution in the consumption of "gas, but a great additional illuminating power would be

" obtained by the use of improved burners. In private houses " (in which, by the way, Argands are very rarely used) the " employment of better burners would tend to reduce the con- " sumption of gas, three of the new burners being equal to " five of those in common use."

The referees next give the values of burners best adapted for the consumption of cannel gas. They are as follows:—

	Illum. Power.
Bat's-wings.	
Sugg's Standard Steatite Bat's-wing, No. 7 .	100
Common Iron Bat's-wing, No. 6	100
Fishtails.	
Common Iron Fishtail, No. 4	100
„ „ „ No. 5	100
Argands.	
Sugg's New London Argand, No. 3 . . .	85
Common Cannel Argand (double cone) . .	76

In reference to the use of cannel gas, which is not likely to extend in London, the referees show that there is really no necessity for it; nor, indeed, for any increased use of cannel coal for common gas. For " if London be even tolerably well " lighted at present, when less than three-fourths of the light " is obtained from the gas, the adoption of good burners would " be sufficient (at least, after the 1st of January next, when " the illuminating power is to be raised to 16 candles) to " ensure a satisfactory amount of illumination without any " increased use of cannel coal." Clearly, if the standard burner makes 14-candle gas into 16, there is no necessity to make any alteration whatever in the manufacture.

For the present, the referees confine the testing for impurities to sulphuretted hydrogen, sulphur compounds other than sulphuretted hydrogen, and ammonia. Of sulphuretted hydrogen there is to be absolutely none. The lead-paper is to be exposed to all the gas used in testing the illuminating power, and the smallest discoloration is held to be conclusive as to the presence of sulphuretted hydrogen.

As regards ammonia, the referees have satisfied themselves that the companies can take nearly the whole of this impurity out of the gas. They, therefore, allow only 5 grains in 100 cubic feet, which represents *in weight* only about $\frac{1}{4000}$ part of the gas. The nitrous acid formed by the combustion of this quantity in a room 20 feet square and 12 feet high, would constitute only $\frac{1}{640000}$ part of the atmosphere of such room, even if it remained unventilated. The referees say that it is a question with chemists whether or not it is advantageous to take the whole of ammonia out of the gas. What " authority " has maintained that the ammonia, which is converted by combustion into nitrous acid, tends to neutralize the sulphurous acid, which is also formed by combustion, we are unable to say. The statement has, no doubt, been made, but we doubt whether it can be received as authoritative. The fact is, that it is the mischief which ammonia does as ammonia, rather than by the products formed by its combustion, that renders its presence in gas objectionable. Whatever may be the opinion of chemists, however, the referees have decided that it is advantageous for the consumer that the whole of the ammonia should be taken out; and they intend in some future instruction to give effect to this opinion.

The amount of sulphur compounds other than sulphuretted hydrogen which shall be permitted is still an open question with the referees. On the one hand, no process is known for effectually purifying gas from them; and, on the other hand, there is no easily applied method for ascertaining how much of them gas contains. Meanwhile Dr. Letheby's apparatus has been supplied to the testing-stations, although the referees state that the result of many experiments has convinced them that the test cannot be relied on as a perfect criterion of the amount of sulphur in gas. The referees may be congratulated on having arrived at exactly the same conclusion as Dr. Letheby himself, who never asserted that his method did secure the whole of the sulphur. They have, however, devised an apparatus of their own, having made many experiments; and this apparatus they believe will meet the requirements of the case. It is singular that these gentlemen, who express themselves so averse to putting the gas companies to unnecessary expense, should have supplied the testing-places with a form of apparatus which at the time they believed would be immediately superseded. The utility of their apparatus, however, they admit requires confirmation; and until they know how much sulphur is present in gas, and how much can be removed by the best modes of purification, they are not in a position to decide upon a maximum. The referees have thus a great deal of work to do before they can carry out all the intentions of the Acts of 1868; and that they believe themselves to be a permanent institution may be gathered from the statement that they consider it their duty to re-investigate the subject from time to time, so as to make the purity of the gas supplied to the public keep pace with the improvements introduced into the process of manufacture.

In the " general remarks " which conclude this report, the referees take credit for having done all in their power to save expense alike to the Corporation of London, the Board of Works, and the gas companies. These remarks can only provoke a smile on the countenances of those who read them—a smile which will probably expand into a broad grin when the reader comes to the passages in which it is stated that, in drawing up their " Instructions to Gas Examiners," their objects have been, first, to enable the testings to be carried out at as little expense as possible to the municipal bodies, in salaries for gas examiners; and, secondly, to furnish such ample checks upon the municipal gas examiners that the gas companies will find it unnecessary to incur the expense of duplicate testing-places, with a salaried examiner for each. Appended to the report is a copy of the instructions for the summer testings, issued on the 31st of March, which we have already published.

Correspondence.

THE GAS REFEREES AND MR. HEISCH.

SIR,—The gas referees having published in your JOURNAL a reply to the report which I had the honour to present to the Special Gas Committee of the City of London on their instructions, may I request you to afford me space to point out the inaccuracies contained in that document? I should have done so sooner, but that my report having been officially communicated by the Special Gas Committee to the Board of Trade, and the reply being addressed to that department, it was thought better to wait and see if any official communication were made to the committee by the Board of Trade before replying in a public journal.

The referees begin by a simple misstatement—namely, that I comment only on the summer instructions. I state distinctly that I report on both, and the point first raised applies to the winter instructions only. I state that during the winter months two hours (more precisely, one hour and fifty minutes) of the time during which the Act of 1868 *prescribes* (not permits, as stated by the referees) that testings shall be made, are left without any test being taken, if the referees instructions are carried out. The last testing for common gas (in which alone the great body of the public are interested) begins at 8 p.m., and ends at 8.10 p.m., consequently this objection remains unanswered. It may be true that more gas is used from five to eight o'clock than after; but those who are obliged to work late are just as much entitled to have the goodness of their gas ensured as those who are fortunate enough to leave work earlier. The quality of the gas of the street-lamps is also of no small public importance between eight and ten o'clock. With respect to the introduction of small quantities of cannel gas at stated times into the ordinary mains, I spoke not only from a knowledge of what might be, but also of what had been done; and if in other places, why not in the City of London? I never stated that the quality would rise and decline "suddenly"—this word is the referees, not mine—but rapidly; it may, and has been made to do so. It is well known that at some gas-works a communication exists between the gasometers used for cannel gas and the ordinary mains, to be used in case of emergency. This can at any moment be opened, and small quantities of cannel mixed with the ordinary gas to increase its illuminating power. The simple statement of the referees that I have no acquaintance with the subject cannot disprove facts. How far any inspection on their part could prevent the use of the means I have alluded to, I leave others to determine; not forgetting, however, that one of the inspectors is a paid officer of one of the City gas companies. I must here remark that the idea of a *daily fraud* is the referees, not mine. I pointed out what was possible under the referees instructions, which would be almost, if not quite, impossible simply under the Act of 1868. As I conceive the object of that Act, in appointing gas examiners at all, to be, as far as possible, to establish confidence between the public and the gas companies, by rendering it practically certain that the former will, during a certain number of hours, be supplied with gas of a given quality, anything which diminishes this certainty is as detrimental to the real interests of the gas companies as of the public.

On the next subject—the corrections of the volume of gas employed to a uniform temperature of 60°, and pressure of 30 inches—the referees purposely create a confusion between the objection to so doing in the case of the tests for illuminating power and those for purity, which rest on totally different grounds. I have not been for 26 years a teacher of chemistry and physics without being perfectly aware of the very elementary facts mentioned by the re-

ferees. In *all* laboratories—my own, as well as that of the College of Chemistry—when *scientific* gas analysis is performed, *all* volumes are corrected to a uniform temperature and pressure, in order that *all* results may be strictly comparable. My objections to the practice of making these corrections in taking the illuminating power are—1. That the process is in no sense a scientifically accurate one, the standard of comparison being most variable, and so far the corrections are a sham; 2. That as the process is undertaken for a strictly *commercial* purpose, and the consumer is told that he pays 4s. per 1000 cubic feet for gas of not less than 14 candles, and no correction to a uniform temperature or pressure is made in charging him, it ought not to be made in taking the illuminating power, which ought to be such as to allow margin for all ordinary differences. As regards pressure, we know that it is practically the same at the consumer's meter and the testing meter. With respect to temperature, I expressly state that the correction is not so objectionable as that for pressure, as the consumer's meter may not be in so hot a place as the photometer meter; but that as we do not know what the temperature of the former is, we have really no grounds on which to base a calculation. If it be true that the consumer's meter is, as asserted by the referees, at a temperature of 40° to 45° in winter, and 55° to 60° in summer, why correct uniformly to 60° at all seasons? On this point, however, I am more than doubtful. With respect to the table given by the referees, I never stated that it is "erroneously constructed," nor that it could be "used in a one-sided manner." I object to its use altogether. I may add that I have never met with any gas examiner who has ever been in the habit of making these corrections; the records kept by Dr. Letheby, Mr. Keates, and others, abundantly prove this. Thus, first, a misrepresentation of what I say, and, secondly, a broad accusation of ignorance, without any proof, are the shifts to which the referees are reduced in attempting a reply to my objections. No better condemnation of their own practice could be found than is contained in the last document issued by the referees—the instructions for testing the meters. In it they very properly order a correction to be made of the volume of gas registered *if the temperature of the meter and the cubic foot measure are not the same*, but we hear not one word of standard temperature or pressure. To be consistent, they should correct the volume registered to 60° and 30 inches pressure, whatever might be state of things at the cubic foot measure. The absurdity of such a proceeding would be palpable even to the referees, yet it is just what they order in the case of the consumer's meter. With respect to the objection to the corrections for temperature and pressure in the tests for purity, it rests on this ground, that "observations taken at an interval of 24 hours give no idea of the temperature and pressure during that interval," and therefore we have really no data on which to found the calculation. Of this point the referees take no notice.

With respect to the ammonia test, the referees again misrepresent what the objection is. I am quite aware that less than 100th of a grain of ammonia may be indicated by the test employed, but that any one would submit to a conviction on the faith of an experiment on such a quantity when every error is necessarily multiplied by at least 40, is quite another matter, and my objection remains unanswered. On the sulphur test I would only remark that, as an old chemist, I believe I know better than the referees what quantities of sulphate of barium can be conveniently and accurately manipulated; while common sense itself tells you that it is bad to exhaust all your stock of material in a single experiment, which may be lost by the breaking of a flask. But, as precedent seems to have more weight with the referees than reason or common sense, I subjoin a copy of the sulphur records kept for years by Dr. Letheby (which are the same essentially as those of Mr. Keates and others, of whose talent and experience as gas examiners even the referees cannot be ignorant), from which it will be seen that he never employs anything like the quantity recommended by the referees. It may be perfectly true that the sulphur apparatuses provided by the referees are perfect in their way, but, as the room in which they stand has a door and a window, the fact remains that, with only the referees instructions to guide him, an inexperienced gas examiner might very innocently leave one or other open for ventilation, and thus ensure the loss of much sulphur, while the most refined precautions are taken to prevent the smallest gain.

On the question of whether the Act of Parliament, which gives them power to prescribe the maximum amount of impurity which the gas may contain, can be construed to mean that they shall order impurities only to be recorded, or permit a much larger quantity than previous Acts have done, the referees are prudently silent. They also purposely ignore the fact that a long series of experiments by Dr. Letheby, and other experienced chemists, have demonstrated that the sulphur obtained is never more than a portion of what exists, and that, therefore, the taking the mean of two experiments is a transparent method of making the gas appear always better than it really is. With respect to records and calculations, I have before me those kept by Dr. Letheby for years, and I have examined those kept by Mr. Keates and many others, and I can find nothing like the monstrosity ordered to be kept by the referees. The very fact of ordering all the details of calculations to be copied into a book is, I believe, unheard of, when the results of the calculations, and the data on which they are founded, give every means of checking their accuracy.

With respect to the calculations themselves being simply a question of arithmetic, if every one had pursued a bad way for years it could not make it a good one; but here precedent is again with me. If (which I much doubt) Dr. Letheby had been in the habit of calculating in the form recommended by the referees, it is somewhat singular that the gentleman who assisted him for a long time, and who was subsequently gas examiner *pro tem.* for the City of London, had never heard of it, while Mr. Keates and others were as much struck with its absurdity as I was. The forms on which the referees lay such stress simply oblige the examiner to write a number of very small and cramped figures to fit the printing. I subjoin a copy of the records kept for years by Dr. Letheby and others, which those of your readers who take an interest in the question can compare with the pages required by the referees.

CHARLES HEISCH,
Gas Examiner to the City of London, and
Professor of Chemistry in the Middlesex Hospital.

Record of Photometrical Results as kept by Dr. Letheby:—

Date.	Time.	Consumption 2 Candles per Hour.	Observed Illuminating Power.	Calculated Illum. Power Sperm=120.	Remarks.

Sulphur Record as kept by Dr. Letheby:—

Date Begun.	Date Ended.	Gas Consumed. Cubic Feet.	Liquid Condensed.	Sulphate Obtained in 1000 Grains.	Sulphur per 100 Feet. Grains.

From this it will be seen that the quantity of liquid usually used is far less than that ordered by the referees.

DUNDEE GAS ARBITRATION.

SIR,—I shall feel obliged by your kindly allowing me to correct some little errors in your report of the evidence which I gave in this matter, which I see is taken from the official shorthand-writer's notes, which were hurriedly printed at the time.

I am made to say, "all cannel coal was used, and some of a *richer* kind;" which should be—"some of a rich description."

The word "barrel" of coals should be "barrow;" and the quantity of gas obtained from cannel, at Perth, stated to be 7900, should be 10,900 feet.

R. P. SPICE.

21, *Parliament Street, Westminster, S.W.,*
June 21, 1869.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JUNE 7, 1869.

The WINDERMERE DISTRICT WATER Bill was read a second time, and committed.

The GREENOCK WATER Bill was read a third time, and passed.

A petition was deposited against the EDINBURGH AND DISTRICT WATER Bill, from the Edinburgh Water Company.

TUESDAY, JUNE 8.

The DARWEN WATER Bill was reported, without amendment.

The WINDERMERE DISTRICT WATER Bill was reported, with amendments.

The KINGSTOWN TOWN Bill; ACCRINGTON GAS AND WATER Bill; and CLEVELAND WATER Bill, were read a second time, and committed.

The DUMBARTON WATER, &c., Bill, and the CLECKHEATON GAS Bill, were read a third time, and passed.

The MARYPORT TOWN AND HARBOUR GAS Bill, and the KINGSTOWN TOWN Bill, were referred to a Select Committee, consisting of the Duke of Buckingham (chairman), the Marquis of Normanby, Earl Nelson, Earl Rosse, and Lord Clifford of Chudleigh, who will sit on Monday, June 14, at eleven o'clock.

THURSDAY, JUNE 10.

The HUDDERSFIELD WATER Bill was read a second time, and committed.

A petition was deposited against the EDINBURGH AND DISTRICT WATER Bill, from inhabitants of Edinburgh, &c.;—against the KEIGHLEY WATER Bill, from T. F. Wallace and another;—and against the SOUTH METROPOLITAN GAS Bill, from the Vestry of St. Giles, Camberwell.

FRIDAY, JUNE 11.

The GLASGOW CITY AND SUBURBAN GAS; the GLASGOW CORPORATION GAS (PURCHASE, &c.); and the GLASGOW GAS Bills, were brought from the Commons, and read a first time.

The RADCLIFFE AND PILKINGTON GAS Bill was returned from the Commons, with the amendment agreed to.

The CONSETT WATER; WALTHAM ABBEY AND CHESHUNT GAS; and SHOTLEY BRIDGE AND CONSETT DISTRICT GAS Bills, were returned from the Commons, with amendments. The said amendments were considered, and agreed to.

The BARNSTAPLE GAS Bill, and the OSWALDTHWISTLE LOCAL BOARD Bill, were reported, with amendments.

The DUNDEE WATER Bill was reported, without amendment.

The MANCHESTER CORPORATION WATER-WORKS AND IMPROVEMENT Bill, and the EDINBURGH AND DISTRICT WATER Bill, were read a second time, and committed.

The DARWEN WATER Bill, and the WINDERMERE DISTRICT WATER Bill, were read a third time, and passed.

Petitions were deposited against the BRADFORD WATER Bill, from the Keighley and Worth Valley Railway Company; the Corporation of Halifax; Undertakers of the Aire and Calder Navigation; and W. Ferrand;—against the IMPERIAL GAS Bill, from the Metropolitan Board of Works, and persons signing;—against the KEIGHLEY WATER Bill, from the Keighley and Worth Valley Railway Company; the Undertakers of the Aire and Calder Navigation; and Messrs. Townend;—against the ST. HELEN'S BOROUGH IMPROVEMENT Bill, from the London and North-Western Railway Company; the St. Helen's Gas Company; the owners of property in St. Helen's; and Sir R. T. Gerard, and others;—against the SOUTH METROPOLITAN GAS Bill, from the Metropolitan Board of Works and Vestry of Lambeth.

MONDAY, JUNE 14.

The IMPERIAL GAS Bill; the SOUTH METROPOLITAN GAS Bill; the KEIGHLEY WATER Bill; the ST. HELEN'S BOROUGH IMPROVEMENT Bill; and the BRADFORD WATER Bill, were read a second time, and committed.

The TRURO WATER Bill was read a third time, amendments made, Bill passed, and sent to the Commons.

TUESDAY, JUNE 15.

The ACCRINGTON GAS AND WATER Bill was reported, without amendment.

The SPALDING WATER Bill was read a second time, and committed.

The GLASGOW CORPORATION GAS (PURCHASE, &c.) Bill; the GLASGOW CITY AND SUBURBAN GAS; and the GLASGOW GAS Bills, were read a second time.

The DUNDEE WATER Bill was read a third time, and passed.

The BARNSTAPLE GAS Bill, and the OSWALDTHWISTLE LOCAL BOARD Bill, were read a third time, with the amendments, passed, and sent to the Commons.

THURSDAY, JUNE 17.

The SPALDING WATER Bill was reported, without amendment.

The MARYPORT TOWN AND HARBOUR GAS Bill was reported, with amendments.

The HUDDERSFIELD WATER; MANCHESTER CORPORATION WATER-WORKS AND IMPROVEMENT; and EDINBURGH AND DISTRICT WATER Bills, were referred to a Select Committee, consisting of Earl Powis (chairman), Earl Home, Viscount Falmouth, Viscount Sidmouth, and Lord Leigh, who will sit on Monday, June 21, at eleven o'clock.

FRIDAY, JUNE 18.

The GLASGOW CORPORATION GAS (PURCHASE, &c.) Bill; the GLASGOW CITY AND SUBURBAN GAS Bill; and the GLASGOW GAS Bill, were committed.

The WINDERMERE DISTRICT WATER Bill was returned from the Commons, with the amendments agreed to.

The BRIDGEND (GLAMORGANSHIRE) GAS AND WATER Bill, and the BISHOP'S STORTFORD WATER Bill, were returned from the Commons, agreed to, with amendments. The said amendments were considered, and agreed to.

The ACCRINGTON GAS AND WATER Bill was read a third time, and passed.

HOUSE OF COMMONS.

MONDAY, JUNE 7, 1869.

The CONSETT WATER; GLASGOW CITY AND SUBURBAN GAS; GLASGOW CORPORATION GAS (PURCHASE, &c.); GLASGOW GAS; and SHOTLEY BRIDGE AND CONSETT DISTRICT GAS Bills, as amended, were considered.

The WEST SURREY WATER Bill was read a second time, and committed.

TUESDAY, JUNE 8.

The BISHOP'S STORTFORD WATER Bill, and the BRIDGEND (GLAMORGANSHIRE) GAS AND WATER Bill, were reported, with amendments.

The WALTHAM ABBEY AND CHESHUNT GAS Bill, as amended, was considered.

The ABERDARE AND ABERAMAN GAS; MILNROW GAS; and WALTON-ON-THAMES AND WEYBRIDGE GAS Bills, were referred to a Select Committee, consisting of Colonel Gray (chairman), Captain Archdall, Viscount Burke, Mr. Lyttleton, and Sir John Duckworth, who will sit on Tuesday, June 15, at twelve o'clock.

THURSDAY, JUNE 10.

The CONSETT WATER Bill; GLASGOW CITY AND SUBURBAN GAS Bill; GLASGOW CORPORATION GAS (PURCHASE, &c.,) Bill; GLASGOW GAS Bill; and SHOTLEY BRIDGE AND CONSETT DISTRICT GAS Bill, were read a third time, and passed.

FRIDAY, JUNE 11.

The RADCLIFFE AND PILKINGTON GAS Bill.—The Lords amendments were agreed to.

The WALTHAM ABBEY AND CHESHUNT GAS Bill was read a third time, and passed, with an amendment.

MONDAY, JUNE 14.

The BISHOP'S STORTFORD WATER Bill, as amended, was considered.

TUESDAY, JUNE 15.

The OXFORD GAS Bill was reported, with amendments.

The GASLIGHT AND COKE COMPANY petitioned for leave to deposit a petition for a Bill.

WEDNESDAY, JUNE 16.

The TRURO WATER Bill was read a first time.

THURSDAY, JUNE 17.

The WINDERMERE DISTRICT WATER Bill.—The Lords amendments were agreed to.

The BISHOP'S STORTFORD WATER, and BRIDGEND (GLAMORGANSHIRE) GAS AND WATER Bills, were read a third time, and passed, with amendments.

FRIDAY, JUNE 18.

The ABERDARE AND ABERAMAN GAS Bill was reported, with amendments.

HOUSE OF COMMONS.

(*Before the Right Hon.* T. E. HEADLAM, *Chairman*; *Mr.* P. RYLANDS, *Mr.* J. WHATMAN, *and Mr.* H. BRUEN.)

HUDDERSFIELD WATER BILL.

THURSDAY, APRIL 22.

Mr. HOPE SCOTT, Q.C., Mr. DENISON, Q.C., and the Hon. GRANVILLE SOMERSET, Q.C., appeared for the promoters; Mr. FITZJAMES STEPHEN, Q.C., and Mr. HOLKER opposed on behalf of the Meltham Local Board of Health; Mr. HIGGINS, Q.C., and Mr. HERSCHELL for millowners and Messrs. G. and E. Mallinson; and Mr. FORSYTH, Q.C., for the Calder and Hebble and the Aire and Calder Navigation Companies.

Mr. DENISON said the title of the bill was, "For transferring to the corporation of Huddersfield the undertaking of the commissioners for the Huddersfield Water-Works, and for empowering the corporation to construct additional water-works and to supply water within extended limits, and for other purposes." The preamble recited that the borough of Huddersfield was a municipal borough under the government of the mayor, aldermen, and burgesses; that before the incorporation of the borough certain commissioners were constituted and empowered, by Acts of Parliament, for the purpose of supplying water to the township and parish of Huddersfield, now being part of the borough; that they completed works for such purpose, and raised a capital amounting to £49,457 by borrowing on the security of their undertaking, and had expended on their works, and in the extension of their mains and pipes of supply, the amount so raised and a further considerable sum out of income; that it would be of great advantage to the borough and neighbourhood if the undertaking of the commissioners were transferred to the corporation, and if the corporation were empowered to construct further works, and to supply water within limits more extensive than those comprised in the commissioners Act; and that it was expedient the corporation should be empowered to borrow money for the purposes of this Act, and have further powers conferred upon them. The estimate of the expense of the new works was £191,500, but the committee would see that they proposed to take a much larger capital than that for this reason, that the promoters were a corporation borrowing on their rates, and had no property of their own, and inasmuch as many people who suffered damage would not wait until the rates were raised, they were anxious to have a capital in hand wherewith such claims for damage, when justly made, might be met and discharged; they therefore proposed to take borrowing powers for £300,000, although the estimate was only £191,500. There could be no objection, as in the Nottingham case, to the promoters taking more capital than they required. The objects of the bill were three—first, to transfer the works from the commissioners to the corporation; next, for enlarging the works; and lastly, for increasing the limits of supply. The two last might be joined together, as they naturally followed each other; for if the gathering-grounds were enlarged, they must increase the limits of supply, and those whose ground might be taken would naturally expect to be supplied by the corporation. He might say, indeed, that no objection existed as to the transfer of the works from the commissioners to the corporation, neither was there any substantial objection to additional works being constructed, provided their opponents were dealt with by compensation in the manner they proposed. Nor was there any objection to the promoters increasing their limits of supply; in fact, there was nothing in dispute except the quantity of compensation water to be given to those who occupied the district which it was proposed to take for their additional works. The chairman would remember that in 1866 the referees of the House said that in schemes of this sort the quantity of compensation water to be given should be 7 inches out of what was assumed to be the rainfall of the year, and the promoters proposed to give a similar quantity in this case. The committee would probably ask how it was that this bill was brought forward again, after being rejected by the House of Lords. The commissioners were an impracticable body for settling any question of this kind; they were no fewer than 71 in number, and not only were they unmanageable in point of bulk, but there was this infirmity attached to them—they had no provision for meeting any claim for damage which might be made upon them.

The CHAIRMAN: How did they raise their money?

Mr. DENISON: They borrowed just as much as they wanted, and if there were any claims for damages there was no reserve-fund to meet them. Supposing a reservoir gave way, and the damage was £100,000, there was actually no way in which that sum could be raised. This point prevailed in the House of Lords, and there was this proof that it was so, for immediately the commissioners got out of Parliament they felt their position so strongly that they set to work to reorganize a new constitution, and to transfer the works to the corporation. They could not turn themselves into a company, because that would not have been tolerated. The alternative therefore was to take steps for incorporating the town, and the charter for that purpose was obtained last year. Then the first act was to arrange for bringing in this bill and to transfer their works to the corporation, so that they might be carried on by them in the usual manner. He saw that the question of finance was involved in one of the petitions. The committee would remember that in the preamble it was stated that the commissioners had applied a considerable sum of income to the enlargement of their works. There was a provision to the effect that they should only earn a profit of 7½ per cent., but there was nothing, as far as he could learn, for doing anything with the excess profits, provided there were any; but they were to calculate the water-rents as near as they could, so that they might pay the interest on their debt, and not make more than 7½ per cent. profit. It did happen there was an excess, and that seems to have been applied, and wisely so, in enlarging their works, instead of borrowing more money for that purpose. In this way upwards of £25,000 had been applied out of the excess of rents. Besides that sum, however, the commissioners had borrowed or were responsible for £10,000 more, which they had also applied to the same purpose. With these transactions the corporation were perfectly satisfied; indeed, it could not matter to them so long as the money had been borrowed *bonâ fide* and properly applied afterwards. The learned counsel then went on to say that, in substance, the water scheme which was propounded in 1866 was identical with this, although not quite so large in its powers; the difference, in fact, was so small that he did think his learned friends would feel it to be worth their while to dispute what he was then saying. Both the commissioners and the corporation had come to the conclusion that the scheme proposed was the best they could have for the interests of the town and district. He did not think that any one would dispute the fact that an improved water supply was required. Statements could be given with regard to population, the present supply, and other details, of which he had a great quantity in his possession, and which could be gone into if the opponents wished it; but he thought the committee would agree with him in thinking that the promoters were not doing enough instead of too much. The learned counsel then explained the proposed area of supply. By the proposed scheme there would be constructed, at Blackmoor Foot, a reservoir with a capacity of 573 million gallons, and with a drainage area of 1712 acres; another at Deer

Hill to contain 118 million gallons, and having an area of 600 acres; and another at Lingard to hold 60 million gallons, with a drainage area of 348 acres at a lower level, skirting along the Merston district, and falling into the Blackmoor Foot. With respect to Lingard, there was no compensation question at all involved, everything with regard to that having been settled. There was a catchment drain, which took in 160 acres, at Wentworth, south of Meltham, and that was the only bit which was proposed to be taken in addition to the scheme of 1866. In clause 31 of the bill, provision was made for the appointment of an engineer, whose duty it would be to settle the proportions of water between the several descriptions of streams which were to be gathered down the catch-water drains. There was a provision, also, for valuing the works, as they were to be transferred to the corporation, and this was all that he need trouble the committee with with reference to the preamble of the bill, the opposition all turning, as he had said, upon the question of compensation.

The COMMITTEE: If there is no opposition, cannot we pass the preamble at once, and then go into the clauses?

Mr. STEPHEN objected on behalf of the Meltham Local Board.

Mr. DENISON: Will any one say why? Our opponents have petitioned formally against the preamble.

Mr. STEPHEN: We say that the whole scheme is very unjust to Meltham—it is not a question of compensation.

Mr. DENISON said Meltham had a population of 4000 or 5000 persons, and in paragraph 10 of their petition the local board began to tell their history. They stated than in 1860 they were appointed under the Local Government Act; that under powers conferred upon them they had constructed water-works, and had expended certain sums of money which they had borrowed, and which were now charged by rates levied upon the district; that they had applied for a provisional order, to enable them to increase their supply, and had obtained the sanction of the Secretary of State, and that the works were then in progress; and, lastly, that the sources, or some of them, from which they derived their present supply, and those from which they must of necessity obtain any further supply, were within the limits over which the corporation were seeking to obtain the control of all springs and streams of water; and the power sought by the bill would seriously affect their rights and privileges, and would be injurious thereto, and also to the works now in progress; and they objected to any interference by the corporation with the waters from which they derived their present supply, or which might be necessary hereafter for the growing requirements of the district. This looked, the learned counsel said, as if the promoters were invading their district, but such was not the case; and, moreover, the committee would be surprised to hear that their application to the Secretary of State was made after the promoters had given notice of their bill, and which was never mentioned to the inspector who went down to examine their scheme, or to the Secretary of State. So much, then, for the bill having been promoted behind their backs. Then they said that the promoters had recognized their works when their bill was deposited. They certainly had not done so. "That by clause 41 of the bill it is proposed to enact that the corporation shall not in any way interfere with the present water supply of the local board of the district of Meltham, or in any way prejudice or injuriously affect or diminish the present sources of supply of water to the existing reservoir and works of, or any source of supply used by, the Meltham Local Board." This was a copy of the clause, but to it they proposed to add a rider in the following words: "And after the passing of this Act the Meltham Local Board shall not intercept, or take, or make, or continue any work intended or adapted for intercepting or taking any part of the water which, at the time of the passing of this Act, or at any time previous thereto, directly or derivatively flows or passes, or flowed or passed, to and into the Brow Grains Dyke above the point at which the same is by this Act authorized to be taken and appropriated by the corporation for the purposes of this Act, or which but for such work would flow and pass to and into the catchwater drains, conduits, or other works authorized by this Act, further or other than such part of such water as the Meltham Local Board lawfully took on or before the said 30th day of November, 1868." These latter words were put in to prevent the board from stepping in and taking the corporation supply, the corporation believing they had sufficient already for their own purposes. All the opposition in this respect melted down to a mere nothing, and it appeared to him not to be a question of preamble, but of clauses. In 1866 they were content with the bill as it then stood, and they proposed to take substantially the same water as they did now, and therefore he could not see why the opponents should be heard, only when the clauses were considered by the committee. Then they said in their petition: "And by clauses 91 and 92, to enable any such local board to levy rates from time to time, to enable them to pay the water-rents made payable to the corporation by any agreement with them; and your petitioners submit that to enable the corporation to confer upon any such boards, so to be supplied with water by the corporation as aforesaid, a power of levying rates upon the inhabitants is most dangerous, and against all parliamentary principle, and ought not to be sanctioned." This seemed as if the Meltham Local Board were jealous of other local boards having the same power as they themselves had. Indeed, the petition meant nothing more than this, that it would be unfair to take any part of their supply, and it certainly read more like a speech of one of the Meltham vestrymen than anything else. Paragraph 26 concluded with a number of reasons why the bill should not be passed, and paragraph 28 complained that the money which the bill sought power to borrow was to be applied in paying for lands acquired by the commissioners without any parliamentary powers. The thing had not been done without parliamentary authority, but the question was whether it had been done rightly. The petitioners then complained that under this bill the corporation would have power to charge the district of Meltham a much higher rate for water than would be charged in the borough. The committee were aware that such was the usual course. If the inhabitants in the district without the borough chose to be rated like those within it, then they could have the water at a lower price as a matter of course. The petitioners next complained that it was proposed to make new roads, and to alter existing ones, and to this no answer was required. Then they alluded to the danger arising from the reservoirs, which might burst some day or other, and they called attention to "two fearful accidents which recently occurred in the West Riding of York" as a proof. All this the committee could realize for themselves without one word being said by him. Then they said they were advised by eminent counsel "that such corporation Acts only enable the corporation to levy rates for municipal purposes, and not rates for the purpose of meeting claims or demands by persons sustaining loss, damage, or injury which may accrue or be occasioned to them, or to their properties, by the bursting, failure, breaking down, or giving way of the reservoir and embankment at Blackmoor Foot, or the aqueducts, conduits, pipes, and works connected therewith, or by the bursting, breaking down, or giving way of any other works which may be constructed by the corporation, or by the overflow of the water from the same works; and they submitted that some express statutory enactment ought to be given by the bill, compelling the corporation to levy rates upon the inhabitants of the borough, for whose benefit the works are constructed, and who derived all the profits and advantages arising therefrom, to meet such claims and demands." The remaining paragraphs in their petition referred to the preamble being untrue, to the undertaking being ill-advised and insufficient in its working details, and to the expense which they had been unreasonably and vexatiously subjected to by the bill. This latter paragraph looked as if they wanted their costs, and that was a matter for the committee to decide. He had not gone through their petition with the idea of answering every objection, as each one could be discussed separately when they came to clauses, but he had read the principal paragraphs in order that the committee might be fully aware of the reasons why the petitioners objected to the preamble. The Aire and Calder and Calder and Hebble Navigation Company's petition stated that the quantity of water proposed to be given by way of compensation would be insufficient, and that it was expedient that further provisions should be inserted in the bill for regulating the supply, so that such supply could be properly secured to them as an independent source. Supposing that the corporation took every drop of water from the river Colne, or from the drainage area, they knew that with a small deduction the water so taken would find its way back again. The object was to get an equalized flow, of course, and nothing more. There were two things to be dealt with—namely, floods and droughts; and it would be their endeavour to provide for droughts by storing the water to be obtained at flood times, so that there might be an equalized flow at all seasons of the year. With reference to the petition of Messrs. Mallinson, it would be found that it bore a wonderful similarity to that presented by the Meltham Local Board, and when the proper time came he should be able to give a satisfactory answer to the allegations it contained. Turning to the question of compensation, he said that a number of rain-gauges had been placed in the district, and until lately the corporation were under the impression that all were substantially identical in their results; but this did not appear to be the case, and in this respect there was a peculiarity which he would point out to the committee. One of these rain-gauges had existed for some time at Harden Moss, and in 1867 it showed 46 inches as the gross fall of rain in that year, at an altitude of 1200 feet above the level of the sea. In that same year a gauge called the Meltham, at an elevation of 925 feet, gave 43 inches, whilst one at Longwood, at a lower height, showed the rainfall to be 39 inches. These results bore out the assertion that the higher they got amongst the hills in that locality the more rain was recorded. There was a gauge upon which the millowners relied at a place called the "Scope," and in the same year this gave the fall as 54 inches, whereas the maximum of all the others, the one at the greatest elevation, only indicated 46 inches. Whether the difference arose from some freak of nature or from something in the hills he could not say, but, at all events, there was that difference to be still accounted for. In 1866 it gave nearly 70 inches, and in 1868, 59 inches, so that there was some peculiarity in the country, no doubt, which caused this gauge to register at a higher rate than the others. The reason he mentioned this was that upon the Scope gauge the millowners themselves relied; and, inasmuch as the real matter in dispute was the quantity of compensation water to be given, of course it became material to see how far that gauge was correct.

The COMMITTEE: They want you to give them as much in fall, according to their gauge, within their district.

Mr. DENISON concluded that such would be their argument. The promoters adopted the figures imposed upon them by the referees in 1866, but the petitioners asked them to go still higher in the quantity which they should give them as compensation. The plan of deciding upon the quantity was as follows:—Supposing the rainfall to be 66 inches, they divided it by 6. Then they took off one-sixth part, which would leave it at 45. Then it was found, by long experience, that on an average 14 inches of rain evaporated, though that did not depend upon the quantity that fell; therefore they took 14 inches from the 45, and that left 31 as the net fall. Then, if they took a third of that, it would be 10⅓ as the amount of compensation to be given. According to the figures of the promoters, the compensation proposed was 6 inches. There might seem to be a startling difference between the two figures, but it was a question for the committee to decide. They would have to say whether they would take the average of the rain-gauges in the district—the three included—or include the peculiar one at the Scope. A place analogous to this was Sheffield, there being but very little difference, if any, between the rainfall of the two districts, and that was settled at 6·6 inches in 1867, and he did not think that anything had happened since then to lead them to believe that it was a mistake. At Barnsley, it was fixed at 6 inches by arbitration, held by the late Mr. Simpson, a water engineer of first-rate eminence, acting between the millowners and the water company, and the millowners accepted his conclusions; indeed, they could not do otherwise, because they had bound themselves to him as their arbitrator. The best way to settle the question would be to ask their opponents whether they had anything to say substantially against the bill; if so, it had better be stated, and then the committee could decide whether the objections should be heard in preamble or upon clauses, the question of compensation being, of course, the most material for their decision.

Mr. FORSYTH said he appeared for the Aire and Calder Navigation Company, and his argument would be that a much greater amount of compensation could be given than what they said; in other words, they were mistaken as to the amount of rainfall in this district. If they could not give them that amount of compensation which was their right, then he should maintain that the bill ought not to pass.

The COMMITTEE thought it best to proceed with these matters in clauses.

Mr. STEPHEN said that the objection of the Meltham Local Board was of a much wider nature, and, if sustained, would go so far to mutilate the bill as to make it impracticable. That part of the preamble to which they objected was this, that it would be a great advantage to the borough and its neighbourhood if the undertaking was transferred to the corporation, and they were empowered to construct other works. They proposed to take the whole stream running down the Meltham Valley, and his clients said that this would interfere with the powers obtained by them under the Local Board of Health Act, 1848, and by which they were the proper persons to supply the district both for manufacturing and domestic purposes. The promoters, they said, proposed to deprive them of important powers then conferred upon them, and to prevent them from meeting the requirements of the district which they had a right to supply.

The COMMITTEE: Surely this is a question upon clauses.

Mr. STEPHEN: I cannot give up my objection to the preamble.

Mr. HIGGINS: I am in the same position as my learned friend.

C. H. Jones, Esq., examined by Mr. HOPE SCOTT.

I am the mayor of the borough of Huddersfield, and was formerly an Improvement Commissioner. There has been a very strong feeling for years with regard to the defective water supply. The last application was made to Parliament in 1866, and at that time the supply was in the hands of the commissioners. The application was rejected by the House of Lords. The commissioners had no funds except the water-rates. The application failed chiefly on the opposition of one particular class of millowners. That created

a strong feeling in favour of a charter of incorporation for the town. Th present area of supply is far too narrow for what is represented by the municipal corporation. We have now practically adopted the scheme of 1866, believing that it was a substantial and a sound one. We have overcome the opposition of the millowners by arrangement, and we have also made arrangements with the Water-Works Commissioners with regard to ascertaining the value of their works.

Cross-examined by Mr. STEPHEN: The scheme of 1866 did not extend so far in the direction of Meltham as the present one. It is very nearly identical with it. The Meltham Local Board has no connexion with the corporation of Huddersfield.

By Mr. HIGGINS: The old works are stationed at Longwood, and we propose to include Slaithwaite, Linthwaite, and Lugard, Meltham, and South Crossland.

Re-examined: Our primary object is to obtain a supply of water for domestic purposes. We have not gone sufficiently into the question of what would be required for manufacturing purposes.

Mr. *Wright Mellor*, examined by Mr. HOPE SCOTT.

I am one of the aldermen of the borough. We have only got a supply for domestic purposes from the present water-works, and that is by no means adequate. We are put to a very great expense in consequence of the short supply, and have for some years been put to great inconvenience for the want of water, having on many occasions had only one hour's supply per day. I have on my property one of the oldest wells, and when the summer has been even moderate the well has been empty, and persons have had to get up at two or three o'clock in the morning in order to catch such a supply as may have sprung up in the meantime.

Mr. FORSYTH did not dispute the want of water at Huddersfield.

Mr. *H. Brook*, examined by Mr. HOPE SCOTT.

I am an alderman of Huddersfield, and proprietor of an extensive woollen manufactory on the river Colne. The state of the water is very bad indeed, so much so that for five months last year I had to cart my water for domestic and sanitary purposes, for the cattle and everything else; it had to be carted into the fields. The rate of mortality in some parts of the district has been very high. The poorer inhabitants have had to fetch water frequently for more than a mile in cans. The people in my district depend entirely upon wells. In the best of seasons our water is bad. We have only one or two wells on private property half a mile apart.

Cross-examined by Mr. HIGGINS: Last year I had to fetch water from a neighbour who had a mill and a bore, and pumped his water from the bore into the reservoir. I have had to cart water during every summer I have lived there. In South Crossland and in Ormley I know they are badly off for water. If we had a large supply I should have no objection to the corporation selling water for trading purposes, but I do not think there would be sufficient. We want the domestic supply first.

Re-examined: We do not wish to deprive the millowners of the water without compensation. I am a large millowner, and have three water-wheels. I believe the millowners will be gainers by this bill, as we shall have the water more regularly than we do. For six or seven weeks we have had no water at all.

Mr. *John Day*, examined by Mr. HOPE SCOTT.

I am an alderman of Huddersfield, and an extensive woollen manufacturer at Mold Green, which is simply separated from the town by the river Colne. We are often in great straits for want of water. Last summer I was much pained to see the wants of the poor people during the dry season. I have seen people at the Dog Kennel well at five o'clock in the morning—40 or 50 of them with cans, waiting their turn to get a supply of water for domestic purposes. I and some of my neighbours have given them water from our works, and from artesian wells which we have had sunk at great expense.

Mr. *A. Crowther*, examined by Mr. HOPE SCOTT.

I am a millowner of Lockwood, which is one of the places coming into the charter. The population is between 8000 and 9000, and the rateable value is £23,000. It depends for water upon wells and springs, and has suffered very much. The principal spring was dry for two months last summer, and there was not a canful of water to be obtained.

Cross-examined by Mr. STEPHEN: We saw no other way of being supplied with water except by joining Huddersfield.

Mr. *John Henry Abbey*, examined by Mr. HOPE SCOTT.

I am the borough surveyor of Huddersfield. The population within the borough is 72,000, and the rateable value nearly £200,000. The total acreage within the borough is 10,400 acres. I have always found a great want of water in Huddersfield.

Cross-examined by Mr. HIGGINS: Longwood is 2¼, Slaithwaite 4, Linthwaite 3, Meltham 5, and South Crossland 4 miles from Huddersfield.

Mr. *C. K. Hare*, examined by Mr. HOPE SCOTT.

I am the managing clerk and collector of the Huddersfield Water-Works. The commissioners have completed all the works named by their existing Act, except a small tank at Snodley Hill, in the heart of the borough. Their loan capital was fixed at £40,000, the whole of which they have raised, and they have exceeded their borrowing powers to the extent of £9457 10s. The whole amount has been expended in laying down the new mains asked for by the Improvement Commissioners, in consequence of the extension of the town by the opening of new streets and increased buildings. The capital account of the commissioners is as follows:—Mortgage debt, £38,970, and unsecured subscriptions, £10,487 10s., making a total of £49,457 10s. Besides expending money thus raised upon their individual credit, they have expended from revenue a considerable sum in extensions and enlargements of mains and other works—about £25,000 altogether. [Witness handed in tables showing the revenue and number of tenants from the year 1830 to 1868, &c.] The revenue in 1868 was £5527 8s. 11d., and the number of tenants, 8210. Our works were opened in 1830. The number of tenants was then 1045, and the revenue from water-rents over £840 18s. 7d. The present average actual charge for water to a tenant is 13s. 5d.; our maximum would be between 17s. and 18s. [Tables showing the quantity of water supplied were produced.] In 1868 the lowest daily quantity from all sources was 64,884 gallons, or rather under 1¾ gallons per head per day. In April the average daily supply for the whole district was 246,739 gallons, or rather over 6¼ per head per day, calculated on a population of 39,000, there being 7825 tenants; in May it was 137,331, or rather over 3½ gallons per head per day; in June, 87,547, or rather under 2¼ gallons per head per day; in July, 64,884, or rather under 1¾ gallon per head per day; in August, 67,400, or rather under 1¾ gallons per head per day; and in September, 89,392, or rather over 2¼ gallons per head per day. During this time the reservoirs became nearly empty. [A table showing the number of hours daily during which the water was on in the year 1865, 1866, 1867, and 1868, was next handed in.] The hours varied from 24 to 4.

By Mr. SOMERSET: During the times when the reservoirs were nearly empty water would only be supplied from three to five hours daily. For weeks at a time the population of Huddersfield have subsisted upon a supply of 180,000 gallons per day. That was so in 1865 and 1868. We only supply now a very limited portion of the present borough—about 8210 houses, I think. There are several districts within the town unsupplied—Dalton, Almonbury, Lockwood, and Lindley, for instance. At Lockwood the poor have to fetch water from a place a mile and a half distant, and the same with the others. We propose in the bill to charge 25 per cent. more for water outside the borough than within it. I think it is fair that this should be so, on account of their being out of the rating powers of the corporation. The money to be raised for the supply of all this district would be upon the security of the borough rates, and not the outside places. The population of Huddersfield is now estimated at 41,000 odd. What is now the borough consists of about 73,000 inhabitants, as there are many places included by the recent incorporation. The district proposed to be supplied, in round numbers, contains a population of 100,000, and has a rateable value of £302,000. There is a small quantity of water supplied by the commissioners for trading purposes, amounting to about £590 a year. The provisions of the bill will enable the local board outside the borough to purchase the water in bulk, which will be a considerable advantage to them, as they will collect their own rates, and manage their own affairs. I estimate our future revenue, if we charged the same rates, at about £14,000; if the maximum charges were made it would be about £25,000. When the reservoirs are full the water is allowed to run into the Longwood Brook. The millowners reservoir at Longwood, which we were compelled to make under the Act of Parliament, is never empty. During the long drought of last year it was rather under 7 feet. [Gaugings of the rainfall at Longwood, on the banks of the reservoir, from 1852 to 1868 inclusive, were produced.] In January, 1868, the return was 4·14 inches; February, 2·99; March, 3·98; April, 1·61; May, 0·84; June, 0·28; July, 0·36; August, 2·29; September, 3·63; October, 3·67; November, 2·91; December, 8·20;—1869, January, 2·90; February, 6·00; and March, 1·23. There are other gauges at Bilberry Hedge Common, Longwood elevation, 1100 feet; Grange Meltham and Harden Moss near Meltham, elevation 1200 feet above the level of the sea. In 1868, at Bilberry Hedge Common, the returns were—January, 5·14 inches; February, 3·9; March, 4·56; April, 2·01; May, 1·23; June, 0·19; July, 0·34; August, 2·10; September, 3·00; October, 4·42; November, 3·70; December, 7·70;—1869. January, 3·03; February, 6·10, and March, 1·38. At Grange Meltham, 1868, January, 4·57; February, 3·70; March, 4·85; April, 1·88; May, 0·98; June, 0·24; July, 0·39; August, 3·10; September, 3·30; October, 5·30; November, 3·80; and December, 9·80—1869, January, 367; February, 7·10; and March, 1·78. Harden Moss, 1868, January, 3·73; February, 4·68; March, 5·85; April, 2·63; May, 2·20; June, 0·21; July, 0·44; August, 3·20; September, 3·45; October, 6·90; November, 5·30; December, 10·90. [Gaugings of the different streams were next produced.] Hoyle House Clough register (gauge 3 feet at 9·30 a.m.), daily average for the month (February), 1592 gallons per minute; Blackmoor Foot register (gauge 3 feet at 3 p.m.), daily average for the month (March), 256 gallons per minute; Brow Grains Dyke register (gauge 5 feet at 4 p.m.), daily average for the month (March), 1733 gallons per minute.

H. Letheby, Esq., examined by Mr. HOPE SCOTT.

I am professor of chemistry in the college of the London Hospital, and medical officer of health of the City. I have examined the present water supply at Huddersfield. I went there on the 1st of this month, in company with Mr. Hawksley, Mr. Glaisher, and Professor Ansted. I visited the reservoir at Longwood, and examined the proposed gathering-ground and sites of the reservoirs. I took samples of water from the streams, and also from the points where the reservoirs are to be. It is a very soft and good water. I had had samples sent to me on the 28th of March, which were analyzed. As to the present supply, the samples taken from the lower reservoir contain from 6 to 8 grains of solid matter per gallon, and the hardness was from 3° to 4½°, reduced to 3° by boiling, by the soap test. The sample taken from the Deer Hill reservoir contained only 3½ grains of solid matter in 1 gallon. It was remarkably soft water. The water at Blackmoor Foot contains between 6 and 7 grains of solid matter in 1 gallon. The hardness was from 2·8° to 2·3°. That also is soft water. The organic matter was very small in quantity, and it was entirely vegetable. In my judgment, the whole of them are very good waters; they are very soft waters, and particularly well suited for the supply of a manufacturing town like Huddersfield, where soft water would probably be used largely for manufacturing and also for culinary purposes.

By the COMMITTEE: The waters are all from sandy strata. All waters diminish a little in hardness by storeage, but these are so soft that they do not diminish much. In storeage the suspended matter subsides; the organic matter is oxidized, and the water is always improved by storeage.

Mr. FORSYTH: I have no objection to make to the water in its present state.

FRIDAY, APRIL 23.

G. Crowther, Esq., examined by Mr. HOPE SCOTT.

I am a surveyor and civil engineer, residing at Huddersfield, and have been employed by the commissioners since the year 1832. The greater part of the works at Longwood were carried out under my superintendence; they consist of two storeage reservoirs of the joint capacity of 63 million gallons. We have a compensation reservoir besides at Longwood, the capacity of which is upwards of 40 million gallons. The first storeage reservoir and the original compensation reservoir were provided for by the Act of 1827. The second Act was passed in 1845, and under this a second and a larger storeage reservoir has been constructed, and the compensation reservoir has been enlarged from its original capacity to about three times. In 1866 the commissioners applied to Parliament for a water scheme, but it was rejected by the Lords. The present scheme is, generally speaking, the scheme of 1866, with enlargements. Mr. Hawksley was the engineer in 1866. Under the scheme we propose to construct a reservoir at Blackmoor Foot, which, when full, will cover a surface of 85 acres, and contain 573 million gallons. It is for the purpose of impounding the flood water from the district, and the water then is to be distributed first in compensation to the mills, and secondly for the supply of the town and borough and adjacent district—that is to say, the old area and the new. It is intended to perform the double function of storeage and compensation, very much to our regret. We had intended to have a separate compensation reservoir for the mills, and to put it entirely under their control; but now it is to be a joint reservoir. It is intended to be a compensation reservoir for the stream called Brow Grains Dyke, or the Meltham water, commonly called Hoyle House Clough. Our plan is to take the catchment at such a level that with a reverse pipe we can come upon the highest mill upon that stream. We propose to deliver the compensation water at a point just above where the highest mill could take it, and thence it would flow over weirs to the others, which are lower down. The site of the reservoir is nearly level ground. We shall have two embankments, the chief being on the northern side, and that will be carried across the valley until it meets the opposite hill. The extreme depth of the embankment will be 65 feet. We have also a small embankment of about 26 feet in extreme depth, which we generally call the saddle. Then on the left and the right

hand side on the top it makes comparatively a mountain; it is very high land to the right, with a natural embankment to the right, and a gentle sloping to the left, and with an artificial embankment on the north; and we have a small artificial embankment to the south, but the better half of it is a natural embankment.

By the COMMITTEE: If there was no embankment the water would flow out at the northern side.

By Mr. HOPE SCOTT: We do not propose to excavate, but to leave the surface intact, for the stratification of the soil is favourable to the formation of hydraulic works. The whole of the interior of the reservoir, as far as we have penetrated by bore-holes, is composed of black shale. Clay, 8 feet thick, extends from near the northern side quite to the southern side. We commence the catch-water drain at a place called Upper Calders. It passes pretty nearly along the contour level, giving it a very gentle inclination in the direction of the reservoir. The surface water of the reservoir is 830 feet. We begin at 830 feet, of course, otherwise we could not fill it to the brim, and then we give it a gentle rise to the Upper Calders, and go on with that until we come to the main stream, the Brow Grains Dyke, and then we cross the dyke and keep on the northern slope, and so deliver the water into the reservoir. It will take the water from about 1403 acres. Then, in addition, there will be the water from 309 acres, which will also come into the catch-water drains of a smaller kind. We intend to have another reservoir at Deer Hill on Lingard Moor, covering an area of 30 acres. There is a small reservoir at present on the site of it, belonging to Lord Dartmouth or to his tenants, which is almost in a state of disuse. This reservoir is intended as a compensation reservoir for the Wessenden Valley. There may be an overflow, and if so we get it in the lower catchment. The capacity of that reservoir in gallons would be 118 millions. At a place called Hay Green we commence a catch-water drain, which would be about 2½ miles in length, and we take the water along the contour there all round, the same as in the other case, down to the reservoir. The surface water of that reservoir would be about 1140 feet in height above the sea level. It will take in the drainage of 600 acres. The compensation water we propose to take by a pipe out of the bottom of this reservoir, at a point at the end of the road; we then return it along the contour, giving it a slight fall, to a place called Rams Clough, and there it is put into a deep gorge or ravine, from whence it flows down the Wessenden Brook, and becomes compensation water to the mills on that stream. The first mill is on the Wessenden Stream, and then it gets down into the main river of the district—the river Colne—and so becomes compensation water, according to its volume, to all the mills on that river. Deer Hill is at an elevation of 1400 feet.

By the COMMITTEE: The natural drainage of the country goes down into the Colne, and then into the river Holme on the southern side, at the end of the Meltham water. Then the Holme runs to Huddersfield, and the Colne by Marsden to Huddersfield, and then the two rivers join on the east side of the town. The country is nearly the backbone of England. All the water runs down to the east to the Humber, and a little way further it takes the western coast and runs into the Mersey.

Mr. HOPE SCOTT: Will you give the places of delivery in and around Huddersfield, with their elevations?

Witness: I will take the northern conduit, or the main-pipe coming up to Blackmoor Foot reservoir, and trace it down through Linthwaite to Meltham Bridge, and it follows on to Locklane End. At that point we have a branch 537 feet above the sea level, and 293 feet below the top water level in the large reservoir. At Locklane End the branch goes off to supply the village of Lindley on the top of the hill, but the bulk of the water will go down the principal main into the intended service reservoir for the supply of the town and the other districts. The chief service reservoir at Snodley Hill would be at 485 feet above the level of the sea, and that would give a fall of 354 feet. From Snodley the town and the portions northward within the borough, going to the extremity of the township about three miles, would be supplied. At Lindley there will be a tank adequate for a certain number of days, which will be filled intermittently by our main-pipe from the Blackmoor Foot. The south side of the town will be supplied by another main coming round by South Crossland and South Land Edge, and at the former place we propose to have another tank or service reservoir, so as to break the force. Netherton will be 495 feet above the sea level; that would give a pressure of 232 from the top of the water to Netherton. We break the pressure to ease our pipes. There is ample elevation to command the whole district. Berry Brow and Armytage Bridge will be supplied from a tank at Netherton. The tanks are of various sizes, according to the district to be served, holding about three or four days supply. The great object is to break the force of the water, otherwise the service-pipes would burst. There are various tributaries to the Colne which run pretty nearly at right angles to the catch-water drain, and they supply separate districts upon which there are manufacturing interests. Some of the mills in the Brow Grains Dyke have steam power. The owners begin to feel that water power is uncertain, and that steam must be introduced if they are to keep their places in the market. Messrs. Mallinson's steam mill, at Hoyle House Clough, is within 50 yards of the river Colne, but on a different watershed. The mill has a catchment area of 370 acres. To this mill we propose to give a constant supply of compensation water. I know the water-works of the Meltham Local Board. They have a reservoir 50 yards long of an irregular shape, narrow at one end and widened out at the other end. It is 24 or 25 feet wide on the average, with a capacity of one million to a million and a quarter. It is supplied by water which springs above, but it chiefly comes in pipes. We do not propose to meddle with this supply. The water from the reservoir goes to the village of Meltham, and supplies not more than 150 or 200 houses. I should estimate the cost of their works at £1500. We take power in our bill to purchase them. This was intended in 1866, and the Meltham Board then offered no opposition. In March last we found that they were executing further works. They were forming an open trench from their reservoir, varying from 3 to 10 feet deep, into a district called the Scope, which is prolific with water, and is a portion of the area from which the water flows into the Brow Grains Dyke. Since I came here I have heard they have closed the drain again. I believe the estimate for our works is £191,000.

Cross-examined by Mr. FORSYTH: All the water which we are going to impound now finds its way into the river Colne, near Huddersfield, and through the Colne into the Calder. The compensation from Deer Hill will find its way into the Colne by means of a pipe, the total quantity being 669 gallons per minute on the days and hours specified in the bill. Mr. Mallinson's compensation water would go direct into the Colne, and other waters, after having been used by the mills, would go indirectly down to that mill and then flow down the Colne. Part of the water will go to the Colne in the shape of sewage. The Colne is the great sewage-drain of the town. Everything goes into it.

By Mr. STEPHEN: All the water above the point of intersection with Brow Grains Dyke we propose to take into the reservoir, and then to return a certain portion of it by the compensation-pipe. It is essential that we should impound the flood water, and prevent all that we can from flowing down the Brow Grains Dyke.

By Mr. HIGGINS: There is a provision in the bill for compensating Messrs. Mallinson at the rate of 218 gallons per minute. I think that 6⅝ inches is too little to give as far as that particular section of Brow Grains Dyke is concerned.

By the COMMITTEE: I act under Mr. Hawksley.

By Mr. HIGGINS: In our previous application to Parliament the compensation water was increased by the referees to 7 inches. Lord Dartmouth's tenants are petitioners against the bill.

Re-examined by Mr. SOMERSET: Lord Dartmouth is not in favour of the bill. We have agreed with his lordship for the land for the Deer Hill reservoir. I have seen but little water in the Hoyle House Clough during the summer season. It was frequently dry during the last summer. I should think that the compensation we propose to give to Mr. Mallinson will be a dozen times more than he could use. The Meltham Board must have known that we were coming to Parliament. We complain of their going to the Home Office, and obtaining sanction to borrow £3000 to carry out further works, without giving us an opportunity of opposing them there, and of their beginning this work before the case had been settled by Parliament. They might have obtained sufficient water from Clarke's spring, without going to so great an expense. The pipes put in by the Meltham Board are half a dozen times larger than is necessary to meet any supply which they might require.

Mr. *F. R. Jones*, examined by the Hon. G. SOMERSET.

I am a land agent and valuer at Huddersfield, and agent for Sir John Ramsden, who has considerable property around the town. I consider the site of the Blackmoor reservoir an exceedingly good and safe one. The site for the Deer Hill reservoir is also a good one, but is of a much smaller extent. I think that the scheme is a very necessary one; in fact, that part of the county could not have carried on much longer without the utmost inconvenience from dearth of water. There is a conduit-pipe from the Meltham works to the Scope, which at present is laid like a drain; it gathers up the water as it goes. Some of the pipes are plastered over with clay. It taps several springs.

The CHAIRMAN: What do you propose with regard to this spring?

Mr. SOMERSET: First of all, we propose to give so much less compensation in respect to this area cut off, and we propose to limit them in writing to clause 41 (rider 2): "From and after the passing of this Act, the Meltham Local Board shall not intercept, or take, or make, or continue any work intended or adapted for intercepting or taking any part of the water which, at the time of the passing of this Act, or at any time previous thereto, directly or derivatively flows or passes, or flowed or passed, to and into the Brow Grains Dyke above the point at which the same is by this Act authorized to be taken by the corporation for the purposes of this Act, or which but for such works would flow and pass to and into the catch-water drains, conduits, or other works authorized by this Act, further or other than such part of such water as the Meltham Local Board lawfully took on or before the said 30th day of November, 1868." We want the whole area, if we can get it; otherwise we must diminish the compensation.

By Mr. STEPHEN: The conduit-pipe may be open at any time; so far as it is laid the joints are covered with clay, but it may be easily washed off, and in one case it was washed off, and the water was running into the pipe. The pipe in some parts is about 8 inches, and in others 6 inches; it was calculated to take much more water than the Meltham people can require. The pipes are capable of being made tight by cement. I do not know that a second reservoir was about to be constructed by the Meltham Board.

Mr. *T. Brook*, examined by the Hon. G. SOMERSET.

I am a land agent and valuer at Huddersfield. I consider the proposed scheme is necessary for the district. I confirm the last witness as to the excellence of the proposed sites for the Blackmoor Foot and Deer Hill reservoirs.

Cross-examined by Mr. STEPHEN: The pipe into the Scope Springs has four heads, I believe. I think the pipe is much larger than is required for the purposes of Meltham.

By Mr. HIGGINS: To some extent I am favourable to this water being devoted to trade as well as domestic purposes. I think that small steam-engines, with one or two horse power, should be supplied by the scheme. If water was to be spared beyond that supplying the general wants of the district, I think it ought to be sold by the corporation.

Mr. *B. Armitage*, examined by the Hon. G. SOMERSET.

I was formerly a cloth manufacturer at Meltham, and lessee of the Brow Mill. We require a regular flow of water for working mills, and for working little mills—those that have no steam power; when they have steam power they can work at any time when they have power enough, but little mills are not so much employed now. Mills that are worked by water have had to stand still at times in consequence of the irregular flow of the Brow Grains Dyke. It has been so for the last 40 years to my knowledge, but much more so now than before, because for a mile and a half long the land has been cultivated almost up to the foot of the hill, and almost the same width. When the rain comes the dyke flows first with great impetuosity, and then declines; there is often a difference between 20 inches to-day and 5 or 6 inches to-morrow. There are six mills empty now, owing to the irregularity of the water supply.

By the COMMITTEE: When the brook is very high there is back water. The mills use more water for bleaching than for washing. We had to go three-quarters of a mile last summer for water for our cattle. The Meltham Water-Works have never supplied me with water, nor any one else on our side of the town. As soon as they heard of the promotion of this bill the Meltham people went to work. In March they commenced all at once with a number of men on this pipe. They never made any attempt to supply us with water until they heard of this bill. I believe that a regular supply of compensation water would be of great advantage to the millowners.

MONDAY, APRIL 26.

T. Hawksley, Esq., examined by the Hon. G. SOMERSET.

I am a civil engineer, practising at Westminster. I am well acquainted with the Huddersfield district. In the year 1865 I was consulted by the Huddersfield Water-Works Commissioners as to an enlarged scheme for supplying the population and district with water. Mr. Crowther and I devised a scheme, upon which application was made to Parliament in the next session. I may say that the origin of the scheme is entirely due to Mr. Crowther. I had very few alterations to suggest. The scheme passed the House of Commons, but was rejected by the Lords. The present scheme is a reproduction of the scheme of 1865, with some additions and improvements. The present number of persons supplied by the existing works is about 38,000. There are some portions of the borough which are in extreme want of water. The entire area of the watershed now proposed to be taken is 2471 acres. It is divided naturally into four areas—773 being the Upper Meltham area, called the Scope; 447 being the Lower Meltham area; 309 being the area of

the shed to Mr. Mallinson's works, called the Hoyle Clough area; and 942 being the area called the Lingard Moor watershed. The two first are the same water. The compensation-pipe along the Deer Hill reservoir gets into the Wessenden Brook, and, descending that brook, supplies the mills there; then it goes into the Colne, and so passes through Huddersfield. We propose to bring the water by a pipe to the very edge of the Wessenden Brook, giving off along its course compensation to the various streams, and then turning water to the head of the Wessenden Brook which now goes into this brook in a very much divided state. This would be an advantage to a great many persons. The compensation-pipe brings the water to the top, above the very highest mill, and then it runs down, which is an advantage to the millowners. It is intended to have an independent engineer to apportion the total amount of compensation which will be given by the committee, according to the several interests on the streams.

By the COMMITTEE: We expect the committee to decide upon each area; and with regard to Lingard Moor, where there are a number of streams intersecting the line of conduit, it has been arranged for the engineer to approve the total quantity due to those streams. This has been done to relieve the committee of a very tedious inquiry.

By Mr. SOMERSET: It meets with the approval of all parties. Lingard Moor is an addition to the scheme of 1866, and there is also a subtraction in consequence of the Meltham Local Board having made works for themselves, which works have appropriated a part of the area which otherwise would have been presented to the committee as to be taken for Huddersfield. My view is to provide the borough with water for domestic purposes, and those incidental trading purposes and uses of water which occur ordinarily amongst populations of large towns. There will not be any quantity of water to be sold for public works, but small quantities of water must be sold in the ordinary course of a water-work—such, for instance, as to stables, and perhaps to brewers, and which are always taken in on every inquiry of this kind.

By the COMMITTEE: Watering the streets, flushing sewers, supplying public baths and washhouses, and all incidental purposes of the kind, will have a supply. We put those in priority to manufacturing purposes in all these cases; but there is an exception in the Act that the population shall be supplied under the compulsory powers, and any other persons only by agreement.

By Mr. SOMERSET: It is very excellent water—very soft and good. The watershed is such as is usual upon the moors of Lancashire and the north of England. It is commonly called millstone grit, but, in truth, it is the lower beds of the coal measures. The surfaces may be called barren; they are only occupied, generally speaking, by sheep, grouse, and heather.

By the COMMITTEE: It is to some extent stained with peat. The Scope area has peat upon it. The effect of it is to colour the water, part of the year, slightly brown. In other portions of the year it runs very bright. It purifies in the reservoir, not only by bleaching, but by a separation of the organic matter, which goes down precisely like the separation of the beeswing in port wine. It forms a crust; indeed, if peaty water be kept in a bottle for a considerable time very quietly, the separation will be seen to take place exactly as it does in the case of beeswing in a bottle of port wine.

By Mr. SOMERSET: Peat is not injurious to health. It is not, of course, a pleasant thing to see water tinted at all, but the water of all the towns supplied from the moors, and all the towns of Lancashire and Yorkshire, and most of those further north, are tinted. They are none of them perfectly white waters.

By the COMMITTEE: The millstone grit has great softness; it contains no lime. The more recent strata contain much more lime than the older. The mountain limestone contains a considerable quantity.

By Mr. SOMERSET: We propose to have a large reservoir at Blackmoor Foot, 85 acres of superficial area, and to contain about 750 million gallons. It would be fed from all the sources, but partly from the Scope, partly from the Lower Meltham area, and partly from Lingard Moor. The catch-water drain takes in the whole of the water of the drainage area at Brow Grains Dyke, and conveys it to the Blackmoor Foot reservoir. There is a compensation-pipe which brings back so much of the water as is proportioned to the quantity of water caught by that conduit, and conveys it to a point upon the brook above the highest mill. There are two—one which brings the water into the Meltham Brook, and another which takes the compensation water into the Wessenden Brook. I have suggested, for the purpose of meeting the wishes of the Meltham petitioners, that when the reservoir is filled to overflowing a shuttle shall be brought down at a certain point upon the Meltham conduit, so as to direct the entire quantity of water flowing from this watershed down its present channel, no more going in that direction until the reservoir becomes again lowered. They appear to like a flood at intervals, and we are quite willing to give it to them. If they do not take it, it will go in the ordinary course into the Colne. In 1866 we proposed to give Mr. Mallinson a money compensation, but he objected, and in committee it was altered to a water compensation at 218 gallons per minute. We have, upon the decision of the referees, calculated the same compensation in the bill at 7 inches, being one-third of what they decided to be the real available rainfall, and that he would get the water from 370 acres besides. The water runs very irregularly down the valley; sometimes at the point at which the embankment of the reservoir is made there is no flow at all. Last year it was tolerably dry for 153 days; in 1866 and 1867 it was dry for a considerable period, but he will have all the year round 218 gallons per minute, which would be a great improvement in his position, I should think. We propose to construct a tank at South Crossland for the purpose of breaking the pressure, in order to prevent fractures of the pipes, or the necessity of making the pipes enormously thick. Another tank is proposed at Netherton, another by the Castle Hill Bottom, and another by Almonbury. My entire estimate for the works is £191,500, excluding the sum of money to be laid out upon the distributory works, which are never included in estimates of this kind. That would amount to about 8s. per head upon the population. We take powers in the bill to raise £300,000. The present works were to be bought by the corporation at a price to be fixed by Mr. Crowther. We propose to supply 100,000 people in round numbers. It is a very increasing population. There will be other little matters besides the £191,500. The cost of distribution will be a very heavy expense. The money is to be raised upon the borough rate. We propose to charge the districts outside the borough 25 per cent. more than those inside it. The cost of distribution, of course, will be somewhat greater. In the dense part of the borough it is only 6s. per head; in many cases outside it will be as much as 9s.; the average will be 7s. 6d. or 8s. We have 400,000 gallons per day on an average from the present supply to the Longwood reservoir. The quantity of water is not uniformly distributable. In the winter months it comes in large quantities, but not so in summer. We shall have rather more than 2,000,000 gallons from the new scheme, and we shall get 400,000 gallons from the old scheme. We shall be able to utilize the water of the old scheme, because we shall exclude the water from the new reservoirs at the time that the water coming from Longwood is sufficient to afford a supply, and therefore we shall, in consequence of having these additional reservoirs, be enabled to utilize both supplies.

By the COMMITTEE: It will in reality make the storeage more complete.

By Mr. SOMERSET: The Deer Hill reservoir will hold about 120 million gallons. The other at Longwood holds about 63 million gallons. We have nothing to do with the Wessenden. The supply of the old and new schemes would give about 25 gallons a head per day. We take the compensation for these mills at what the referees stated it to be—namely, 7 inches of rainfall, being one-third of 21 inches. This has been adopted so frequently now that it may be considered to be almost a settled rule—not one-third of the whole, but one-third of the available rainfall. The mistake at Liverpool and some other places—as Manchester, for instance—was taking not one-third of the available rainfall, but one-third of the average. Now, in all wet years a large quantity of water goes to sea without being utilized at all; for instance, in the present year nearly all the rivers have been running over from November until the present time. Of course the water is not utilized, and could not be, even if there were millowners reservoirs. What we do, therefore, is to suggest what we know to be the proportion of water which cannot be utilized, and then to take one-third of the remainder. We know from long continued and very exact experience that the quantity of water which cannot be utilized is one-sixth of the rainfall; we therefore take one-third of five-sixths, and that we find we can utilize by means of the reservoirs, made still of a very large size, but such reservoirs as we are generally able to make in watersheds in those districts.

By the COMMITTEE: To hold the whole of the available water the reservoirs would have to be so enormously large, and we have found that it would take 500 days to utilize the whole of the water of one of the watersheds, which is wholly impossible to occur.

By Mr. SOMERSET: Here we have about 200 days storeage, which is constant. I ought to add that we find again, that if one-sixth be deducted from the average rainfall, the residue will represent almost exactly the mean of three consecutive dry years. We make our reservoir so as to continue the supply uniformly throughout three consecutive dry years, both for the purpose of compensation and the supply of the town; and we know that when we make the reservoirs of about the same size as they are prepared to make them in this case, the town may depend upon having a regular average supply whatever may be the state of the weather during those three consecutive dry years. Then from the five-sixths we have to deduct the loss by evaporation, which on those hills would be about 14 inches per annum. It is evaporation from the surface of the ground. At Sheffield it has amounted to rather more.

The COMMITTEE: How do you get at 14 inches?

Witness: I will take something which is divisible by six. Suppose we have a rainfall of 42 inches, measured by a rain-gauge upon the ground. From the 42 we deduct one-sixth, which is 7 inches, and that leaves 35 inches. The 35 inches will be the quantity of water which we can realize by years of storeage, and it will at the same time represent the quantity of water which actually falls in dry years—that is to say, that upon a watershed where, on an average of a long term, we find 42 inches of rainfall, we shall then by reference to the tables find that the mean of three consecutive dry years, or low years, following each other will be in almost all cases 35 inches, or within half an inch of the quantity, one way or the other. Then from the 35 inches we have now got practically to years that we can manage. We have rejected the very wet years, which are unmanageable, and have brought our calculations down to the years which can be managed and dealt with. Then we ascertain the fact that 14 inches of rainfall will be lost by the evaporation into the atmosphere. We get at this by actual experience. There are two modes. First, we may get at it by receiving all the water into our reservoirs, and measuring what we can get out of them, and compare it with the rain-gauge. Another mode is by gauging the water which runs off the country, in a stream, for instance, putting a gauge upon that, and measuring it every day, so as to ascertain actually what runs off. Then supposing in these three years 36 inches fall, we shall find by actually gauging the stream that 21 inches has run off, and the difference between the 21 and the 35 is the 14 inches of which I have spoken. By those means we get down to 21 inches, as being the quantity of water that will find its way into the reservoirs. Then we say, now we will divide that into three portions, two of which shall go to the town, and one of which shall be sent in a regular stream to the millowners, in compensation for the regulation flow, very much smaller at one time of the year, and very much larger at another, which they had before possessed. The first deduction of one-sixth is made for this reason: a very large quantity of water runs to waste after the reservoirs have become full, and we find that one-sixth agrees precisely with the fall in the year in which the water does not run.

By Mr. SOMERSET: The unmanageable water is that quantity of a rainfall which, over a period of 20 years, will go to water, in spite of any works that could be attempted to be made to store it.

By the CHAIRMAN: I suppose it would be possible to have a climate in which the average was perfectly equal, but at the same time in each year great storms, and there might be a great deal of water, although the average might be nearly equal.

Witness: That is so. I have lately had, in Sardinia, to make a reservoir where one cannot store more than one inch in a twelvemonth; but I am speaking of the climate of England.

By Mr. SOMERSET: It is the actual experience of something over forty years. I have worked it out by a great number of diagrams. [Produced.] I take the gross rainfall in this particular district to be, as nearly as possible, the same as Sheffield, which is 40 inches, or rather 39$\frac{4}{5}$; but we have taken 42 as the basis of our calculations. The rainfall varies very much between the tops of the hills and the lower ground. The difference for elevation is about 3 per cent. for every 100 feet of height, the aspect being the same, and other circumstances equal. We take 42 inches for several reasons, one of them being because, after a long inquiry, that was the quantity which was settled by the referees; they settled upon 21 inches as being the available rainfall, which corresponds, in the way I have mentioned, exactly with the 42 inches of which I am speaking. With regard to the Brow Grains Dyke, of 1220 acres, the compensation to be given would be, upon this calculation, 862 gallons per minute for 12 hours of lawful working days. We consider, in taking the water of the Meltham district, that we are giving two-thirds to the inhabitants of Huddersfield to drink, and one-third as compensation. This is the principle upon which the bill is based. The Hoyle House Clough, in which Messrs. Mallinson are interested, would have 218 gallons per minute, making a total, with the 862 gallons, of 1747 gallons per minute. We should stop the compensation supply on Sundays, Christmas Day, and Good Friday. Since the bill has been deposited, a pipe has been laid down by the Meltham Local Board up to the Scope springs. That would divert the water of 186 acres from our scheme. They are not taking the whole of the water from the area at present, though they are entitled to do it. They can use it as they choose. Our supply will be altogether about 2$\frac{1}{2}$ million gallons. There is no doubt we shall have to come to Parliament again for more water in the

course of five or seven years. I anticipate that for many months in wet years there must be an overflow of water from our reservoir down the Brow Grains Dyke.

Cross-examined by Mr. FORSYTH: There will be two compensation-pipes from the reservoirs—one from Blackmoor Foot, which goes down to New Bridge from the Brow Grains Dyke, and another that goes down the Deer Hill reservoir to Rams Clough. The water will be apportioned according to the award of the referees. The water, after being utilized by the inhabitants of Huddersfield, will find its way to the Colne through the sewers as a matter of course.

Mr. FORSYTH was proceeding with the cross-examination as to compensation, when Mr. Somerset objected to his *locus standi*, the learned gentleman appearing only for the Aire and Calder Navigation Company.

The COMMITTEE intimated that the Aire and Calder Navigation Company were not entitled to go into the question as to the compensation clauses, but only into the general question as to the basis of the calculations.

Mr. FORSYTH then asked the witness if the number of gallons specified in three of the clauses of the bill were determined by the amount of water in inches, as showed by the rain-gauges.

Witness: It is determined by them, by the application to them of the experience gained over forty years in the same district or near thereto. The rain-gauge at Scope Moss showed a larger rainfall than the others. It was excluded because it was perfectly abnormal, and had application only to a very insignificant area, and under circumstances which made it applicable to the district generally. The gauge is placed not only in a sort of funnel, but it is immediately beneath an escarpment, where rain would be collected to the extent of 20 per cent. more than elsewhere. We had a most lamentable instance of that in the case of the Liverpool Corporation Water-Works, where a similar gauge was taken, there being no other gauges in the district to which to refer, and an amount of compensation was given there which was perfectly ruinous; consequently the corporation reservoirs failed, and the town was reduced to extremity. I do not say that all engineers of eminence are agreed as to the deducting one-sixth as a given quantity from the gross rainfall for what is called unmanageable water. I do not wish to speak of the views of other engineers. A great many of them do, but, if they do not do it directly as one-sixth, they make an allowance, which amounts to very much the same thing. Some of them do it in an indirect way. I choose to do it directly, because the result of experience works out to one-sixth, and therefore I adopt it. Other engineers allow in a variety of ways for the difference between the water which can be retained in the reservoir and the whole quantity which runs into it, and part of which runs away over the waste weirs.

Mr. FORSYTH then proceeded to the question of sewage, and again Mr. Somerset objected.

The COMMITTEE allowed the objection.

By Mr. STEPHEN: I think that Meltham ought to be put upon the same footing as Huddersfield, exceptionally, because we take water from their district; but in the case of the other out-districts we do not take any water from them, we only convey it to them at considerable extra risk, and therefore they ought to pay an extra per centage for the supply. Meltham has borrowed largely upon the public rates for the purpose of making their works and reservoirs, and yet they have only 2000 people to serve. If the interest of the money is distributed over the 2000 people it will come to more than we shall get from you, and you will therefore be supplied by us at a cheaper rate than you are now supplying yourselves. Your compulsory water-rate is levied over all property, whereas our charge would only be to the actual domestic consumer; and if we had your works and paid you off, your people would be relieved of a large amount of taxation, which is now not only very unequal, but very unjustly distributed.

By Mr. HIGGINS: For a great scheme like this, if it be dealt with generally, I should say that Messrs. Mallinson are entitled to the same number of inches of compensation water, having regard to the drainage area, as the Meltham millowners; but if it be dealt with fractionally, I should say not. I should propose to give 7 inches all round. Six inches would be about their fair proportion, as compared with the 8½ inches upon the Scope.

Mr. STEPHEN: Is it a fact that the clouds striking upon those hills, which are called the backbone of England, a large quantity of rain falls on the summit to the eastward?

Witness: It falls more after it has passed the summit.

By the COMMITTEE: Is there more rain falls on the eastward side than on the westward?

Witness: Yes; but that is only within a mile or two, just where the clouds are brought over the hollow on the lee of the hills, and there precipitate their rain; after that, all they have precipitated does not go forward, so that when you get to Leeds you have a rainfall of only 22 and 24 inches, although Leeds is so near. Then again at Sheffield the same thing happens; we have 40 inches in a similar situation at a similar height to this, but we go a very few miles down to Doncaster, and there it is only 22 inches. The reason is that the clouds have dropped their moisture, and, of course, have less to give out as they travel eastward. The great bulk of the rain in England comes with the westerly wind.

Mr. HIGGINS cross-examined the witness as to the rain-gauges in the neighbourhood, for the purpose of showing that he was mistaken in his calculation as to the quantity of water which was to be derived from this particular drainage area.

Witness still maintained that about 7 inches would be the fair quantity to allow for compensation at Meltham; but he was not bound, whilst saying this, to admit that if the area was cut up into different watersheds, then a larger amount of rainfall would fall to the Scope area than to the rest of the ground.

James Glaisher, Esq., examined by the Hon. G. SOMERSET.

I am superintendent of the meteorological department of the Royal Observatory at Greenwich. I have for 40 years paid great attention to the subject of rainfalls all over the kingdom. I visit different districts for the purpose of examining the accuracy of rain-gauges, their position, and so forth. I continually receive reports from different places. I have known the Longwood gauge for some years. When I was there two years ago I felt there was a deficiency of information, and I suggested that other gauges should be placed in the district. The Huddersfield Water-Works have got the old gauge of 650 feet high, a mile to the west of Nettleton Hill. The next one is a rain-gauge 925 feet above the level of the sea in the Meltham district. The other is at Harden Moss, 1200 feet above the sea. Another gauge has been placed at the Scope, but I have not yet observed it. The district varies very much. The rainfall in the district from which water is to be derived has been, during 17 years observation at Longwood, a mean of 32½ inches at 600 feet height. If I increase the height at Longwood 32½ inches, by 3 per cent. upon every 100 feet, which in this locality is 1 inch for every 100, it will bring the average height to 1100 feet, or 1150 feet as the average height of the catchments generally; that would give me 37 inches and six or seven tenths, and if I take these two years, the mean of which is $38\frac{7}{10}$, knowing that the mean of the same two years at Longwood is $6\frac{7}{10}$ or $6\frac{6}{10}$, then I obtain the average of the whole, reducing this by seven-tenths, at about 38 inches for the average fall of rain at this place. I think that the average fall of rain in the Scope will be between 48 and 56 inches.

By the COMMITTEE: Does your 3 per cent. increase go on to the top of the hills?

Witness: So far as experiment has gone it goes to about 2000 feet, which is the average height of the clouds in this country. As far as experiment goes it seems to diminish rather above that elevation.

By the COMMITTEE: The rainfall about the Scourfield Pikes is 136 inches in the year—180 in some cases, right up at the top.

The COMMITTEE: That is on the western side of the country, on the first meeting of the clouds as they come from the Atlantic. Have you got the average of any different places that you can give us?

Witness: Worley Moor, 47 to 57; Wallhead, $32\frac{6}{10}$; Rastrick, $32\frac{6}{10}$; Musfield, $25\frac{6}{10}$; Ingbirchworth, 900 feet, a good deal to the east, $38\frac{6}{10}$; Carlcoates, $58\frac{3}{10}$; Penistone, 717 feet high, 31; Laddleworth, $40\frac{5}{10}$; Neyden Brook, 900 feet high, $42\frac{4}{10}$; and Blackstone Edge, $41\frac{6}{10}$. These are observations for a number of years, from 10 to 20 generally. I do not take five of them. I take the gross rainfall in the district to supply Huddersfield at 42 inches. I quite agree with Mr. Hawksley as to the division of the rainfall into sixths.

By the COMMITTEE: You have told us, and Mr. Hawksley as well, that the rainfall is the greatest on the lee side of the highest point. That would not account for the peculiar wetness of this district?

Witness: That will account, in a great measure; but that excessive rain is in a very limited area. If we find that at 1125 feet high there can be a rainfall differing in one year by 19 inches from that at 200 feet lower, it is evident that that heavy fall is very limited in extent, and in determining the average from the Scope gauge, and every gauge in proportion to the area, the whole rainfall comes to about 42 inches. High land will influence and cause a great deal of rain.

(To be continued.)

Legal Intelligence.

VICE-CHANCELLOR'S COURT.—FRIDAY, JUNE 4.

(Before Vice-Chancellor Sir W. M. JAMES.)

PARKES *v.* STEVENS.

The Vice-Chancellor gave his judgment, or rather verdict, with reasons, in this case, which came before him upon the trial without a jury of certain issues as to the validity of the plaintiff's patent for improvements in gas-lamps, and the question of infringement of such patent by the defendant in the globular lamps recently erected by him in New Palace Yard. In 1862 the plaintiff obtained a patent for certain improvements in gas-lanterns suitable for suspension in railway stations and other public places, the improvements being stated in the specification to consist in the construction of lamps of a globular form, each piece being the segment of a sphere, while, "from the absence of apertures in the middle bead and the disposition of the metal in its upper and lower rings and ribs, which are few in number, comparatively little surface is presented to intercept the radiation of light, and consequently little or no shadow is thrown." The door of the lamps manufactured under this patent opened outwards, and was fixed by a hinge to the adjoining segmental rib. It was found, however, inconvenient in many respects, and the plaintiff after some experiments adopted a revolving or sliding door, and enclosed in a light spherical frame corresponding with the outer surface of the lamp. In the course of these experiments the plaintiff otherwise improved the mode of manufacturing such lamps, the great object of the improvements being, for which he obtained a patent in October, 1865, as stated in his specification, "to produce a glazed lamp, the frame of which shall throw little or no shadow, and yet at the same time possess the requisite strength and also facilities for lighting and cleaning the lamp." The invention was stated to relate "to the construction of lamps of a class forming the subject of a patent granted to me bearing date the 26th day of June, 1862 (No. 1876), which lamps are particularly applicable for railway stations or in large exposed areas, either enclosed or open." The claim sought to be protected by the patent was "the arrangement and combination of parts hereinbefore described and represented in the drawings annexed in the manufacture of railway station and other gas-lamps." The defendant, who is a gas engineer, carrying on business in Southwark Bridge Road and at Glasgow, had, about the beginning of last year, under an order from Mr. Barry, the Government architect, supplied the lamps which are now placed in New Palace Yard. These lamps, which were globular in form, with revolving or sliding doors, were alleged by the plaintiff to be an infringement of his patent of 1865, and he had accordingly filed his bill to restrain such alleged infringement. The defendant disputed the validity of the patent, and denied infringement, and issues were directed for trial before his honour without a jury, as to—1 and 2, novelty and utility of the invention patented by the plaintiff in 1865; 3, sufficiency of specification; and, 4, infringement of the patent by the defendant.

Mr. THOMAS WEBSTER, Q.C., Mr. KAY, Q.C., and Mr. EVERITT were for the plaintiff; Mr. AMPHLETT, Q.C., and Mr. W. H. G. BAGSHAWE were for the defendant.

The VICE-CHANCELLOR, after stating the issues, &c., said: I am of opinion that the plaintiff has produced, by a skilful and ingenious arrangement and combination of the parts of the framework of his lamp, an article of manufacture of great neatness, even elegance of form, well calculated to produce the desired end—that is, the framework throws little or no shadow, while it at the same time possesses the requisite strength and facilities for lighting and cleaning. There is evidence, not contradicted, that the arrangement and combination of the parts were new. It required some thought to design it, some labour to give the design practical form and effect; and it seems to have answered better, taken as a whole, than any lamp previously designed for the same object. My verdict, therefore, on the first three issues is in favour of the plaintiff; but the defendant contends that the specification is not sufficient, and relies for this objection on the judgment of Lord Westbury in *Foxwell v. Bostock*—the sewing-machine case—to the effect that a patent for the improvement of a machine must with sufficient distinctness describe the particular parts of the machine which are alleged to be improved, and the particular improvement for which the protection is claimed. I need not say that I should feel myself bound by that decision if I did not, which I do, most entirely concur in the judgment. It is obvious that a patentee does not comply, as he ought to do, with the condition of his grant if the improvement is only to be found, like a piece of gold, mixed up with a great quantity of alloy, and if a person desiring to find out what was new and what was claimed as new would have to get rid of a

large portion of the specification by eliminating from it all that was old and common-place, all that was the subject of other patents or of other improvements, bringing to the subject not only the knowledge of an ordinarily skilled artisan, but of a patent lawyer or agent. For example, supposing that a compensation pendulum was now for the first time invented, it would not do to patent improvements in clocks in general terms, and give a specification of the whole machinery of a clock, introducing somewhere in the course of the description the mode of making a compensation pendulum, and then end by claiming the arrangement and combination aforesaid. He must say expressly: "I claim the invention of a compensation pendulum, and I make it thus." But I am of opinion that that case does not apply to or govern such a case as the present. After all, the question of sufficiency of specification is not a question of law; it is a question really of fact in each particular case. In this case I am of opinion that the patentee has a right to have his specification of 1865 read with his specification of 1862; and, reading them together, I do not think any maker of lamps would have any substantial difficulty in ascertaining what was claimed under the general description of "the arrangement and combination of parts hereinbefore described and represented in the drawings annexed." But, the patent being for the arrangement and combination of parts so as to form an entire lamp, and not being for, or claiming to be for, any particular part, the last question arises—is the introduction into a lamp, which is not alleged in any other respects to have adopted any part of the plaintiff's arrangement and combination, of a sliding door an infringement? The plaintiff's counsel have contended that it is, on the authority of the case of *Lister v. Leather* (8 Ell. and Bl.). The authority of that case has been pressed upon me as if it really established this, which would be a most startling proposition, that a patent for a combination or arrangement would be a distinct patent for everything that was new and material, and that went to make up the combination. The marginal note, if read hastily, is calculated to give some colour to that contention. But if the judgment be read, it will be found to give no warrant whatever for such—I must call it—baseless notion. The law is summed up thus:—The cases establish that a valid patent for an entire combination for a process gives protection to each part thereof that is new and material for that process, which is really nothing more than stating in other words that you not only have no right to steal the whole, but you have no right to steal any part of a man's invention; and the question in every case is a question of fact—is it really and substantially a part of the invention? I will again refer to the illustration of a clock. Supposing that a clock was now for the first time invented and patented as a machine for measuring and indicating time, a man could not evade the patentee's right by substituting a spring for a weight or by leaving out the whole of the striking apparatus. But the principle of that case has no application whatever to the present case. Even if there had been any sufficient novelty or merit in the substitution of a sliding door, I should have held that that was no part of an invention for producing "a glazed lamp, the flame of which shall throw little or no shadow, and yet at the same time possess the requisite strength and also facilities for lighting and cleaning." The sliding door has nothing to do with the shadow, has nothing to do with the strength, and gives no facilities for lighting or cleaning. The advantages are altogether collateral to the object of the invention, and, indeed, so far as the sliding goes, it diminishes the facilities for cleaning. The advantage claimed and proved is that in the hands of the class of men employed to light and clean, it is far less liable to breakage. And that ought to have been the subject of a distinct claim if it was intended to have been, and could have been, protected. But I am clearly of opinion that there can be no patent right in the substitution of a slide for a hinge, whether applied to the door of a house or the door of a carriage, or the door of a lamp or lantern, whether large or small, suspended or not suspended. It was hardly contended before me that the introduction of that alone would have been sufficient to sustain a patent, but it was gravely contended that because it was, as alleged, a novel part of a novel combination and arrangement it was protected. To say that a patent for an entire combination is a valid patent for a part, when that part would not have itself been patentable, is in my judgment a *reductio ad absurdum* of the supposed principle of *Lister v. Leather*. I do not think it necessary to say more on another part of the patent than this: I doubt, and perhaps more than doubt, whether the plaintiff's patent is not confined to gas-lamps suspended. My verdict on the issue as to infringement will therefore be for the defendant.

COURT OF BANKRUPTCY.

THURSDAY, JUNE 16.

(*Before Mr. Registrar* ROCHE.)

In re BENJAMIN HIGGS—THE FRAUDS ON THE GREAT CENTRAL GAS COMPANY.

Serjeant SARGOOD and Mr. LUCAS appeared for the petitioning creditor, and Mr. BAGLEY for the Great Central Gas Company.

This was a first sitting for proof of debts and appointment of assignees under an adjudication made against the notorious Benjamin Higgs, who absconded a few months since, after defrauding his employers, the Great Central Gas Consumers Company, to the extent of over £70,000. The petitioning creditor was Mr. Krehl, of 48, Coleman Street, restaurateur, to whom the bankrupt owes £600, and in the proceedings Higgs is described as of Broom Lane, Teddington, gentleman. Apart from the claim of the company the debts do not exceed £10,000, with assets estimated at about the same amount.

Mr. BAGLEY said, on behalf of the Great Central Gas Company, he had to tender a claim for £71,214 2s. 2d. The bankrupt was in the service of the company for many years, and had been in the habit of receiving money for gas and products of various descriptions, which, instead of properly accounting for, he had applied to his own use. From an investigation of the company's books it had been ascertained that the moneys so obtained and applied amounted to the gigantic sum he had mentioned. The figures were arrived at by the report of the secretary and of Mr. Chatteris, after an investigation of the books. The company did not propose to take any part in the choice of assignees, but only desired to enter a claim upon the proceedings, so that no dividend might be declared until the matter had been disposed of. It was the anxious desire of the company to discover the whereabouts of Higgs, and bring him to justice, but, pending those proceedings, they desired to have their claim filed by way of notice to the creditors. Of course, if it were allowed, no dividend would be paid out of the estate without the claim being disposed of; but he submitted that it would be a monstrous thing that the affairs of the bankrupt, in which the shareholders of the company had so large an interest, should be administered without any advantage to them.

The REGISTRAR observed that the effect of that would only be to defer the declaration of any dividend until after the claim had been disposed of.

Mr. LUCAS, as representing the petitioning creditor, submitted that the company ought to show like any other creditor, by the production of books and vouchers, that they had any claim at all. It would be time enough for the company to seek to establish their claim after they had done their duty to the public by prosecuting the bankrupt.

Mr. BAGLEY said they would be very glad to prosecute if they had the chance.

Mr. LUCAS said his learned friend, Serjeant Sargood, with whom he had been instructed, but who had not yet arrived, entertained the same opinion, and, in his absence, he asked that the claim might stand over until the company was prepared to substantiate it. The company must furnish a debtor and creditor account, and produce vouchers showing how they made out that the estate was indebted to them. They claimed a large sum of money; but whether it belonged to them as well as to the bankrupt it was impossible at present to say.

Mr. BAGLEY said these objections would be all very well to urge if the company wanted to prove, but when it was only asked that a claim might be allowed, he had never known it necessary to go into vouchers. As it was he had affidavits which were more than sufficient for the only purpose he had in view. One of those affidavits was made by Mr. R. M. Massey, the secretary of the company, and was as follows:—

1. Prior to the 5th day of March last, Benjamin Higgs had been for many years a clerk in the service of the Great Central Gas Consumers Company, but on that day he absconded from his employment.

2. At or about the dates mentioned in the schedule appended to this paragraph of my affidavit, I handed to the bankrupt cheques on Messrs. Glyn, Mills, and Co., the bankers of the said company, for the several sums specified in such schedule, amounting in the aggregate to upwards of £1028 6s. 7d., for the purpose of discharging, to the extent of the amounts for which the said cheques were respectively drawn, debts due by the company to the creditors named in such schedule. I have, however, since ascertained that the said cheques were not applied in payment of the debts of the said company, although the same have been paid by the said company's bankers; on the contrary, I have been informed by Messrs. Glyn, Mills, and Co., with whom the bankrupt had a private banking account, and the same appears by the credit note, that the check for £474 1s. 6d. drawn in favour of and for the purpose of payment to the Grays Chalk Quarries Company, was paid into the banking account of the bankrupt. I am likewise informed by the said bankers that the cheque for £252 2s. 8d., drawn in favour of and for payment to the North London Railway Company, was paid into and credited to the banking account of the bankrupt, as the same appears by the bankrupt's pass-book. From such pass-book it appears likewise that at the date of the absconding of the bankrupt the said account was overdrawn.

1868.—August 27.—Grays Chalk Quarries Company	£217	11	6
1869.—January 14.—H. S. Silverlock	47	15	0
" " W. A. Ross	33	15	11
February 13.—North London Railway Company	255	2	8
" 15.—Grays Chalk Quarries Company	474	1	6

3. Since the date of the absconding of the bankrupt I have been informed and believe that James Read, a clerk who received at the works of the company at Bow Common moneys, being the proceeds of sales at the works of the company, had been in the habit of paying the amounts collected by him to the bankrupt. I am informed, and verily believe, that the amount so received but not paid by the bankrupt to the banking account of the company amounts in the whole to £4561 4s. 6d.

4. In particular I am informed by the said James Read that, on the 15th of February last, he paid to the bankrupt a cheque of the Alum and Ammonia Company, Limited, on the East London Bank for £211 1s., and I have since ascertained from Messrs. Glyn and Co., and the same appears from the credit note, that the said cheque was paid into the private banking account of the bankrupt.

5. Since the date of the absconding of the said bankrupt, I have likewise ascertained that certain collectors who received gas-rents due to the said company were in the habit of paying the same to the bankrupt; and I am informed, and verily believe, that the amounts so received by the bankrupt, and not paid into the company's banking account, but misappropriated by him, amount to £65,624 11s. 1d.; making the total amount of the moneys had and received by the bankrupt, and by him not paid or accounted for to the company, an aggregate sum of £71,214 2s. 2d.

6. On the 13th of March last a warrant was issued, upon the application of the solicitor of the company, for the apprehension of the bankrupt upon a charge of embezzlement and larceny.

7. Since the date of the absconding of the bankrupt unceasing efforts have been made to ascertain his whereabouts, and to secure his apprehension, and for that purpose a reward of £200 was offered by the said company for such information as would lead to the apprehension and conviction of the bankrupt, and detective police officers have been up to a recent date continuously employed, and considerable sums of money have been paid by the said company in their efforts to secure the arrest of the bankrupt, but hitherto without effect.

The REGISTRAR said the question was how any possible injury could be done by entering the claim. It was merely a notice, and no money could be disposed of in the shape of dividend till it was disposed of.

Mr. LUCAS said all that he desired was to make the company come forward and produce their books.

The REGISTRAR: When they seek to convert the claim into a proof, then will be the time for them to produce their books.

Mr. LUCAS said they were in part barred by the statute of limitations, some of the items going as far back as 1862.

The REGISTRAR said he had a very strong recollection of the course adopted in the case of Sir Morton Peto. There was some question of the same kind raised. It was not a case of defalcation, but of a large claim by the London, Chatham, and Dover Railway Company. There the commissioner allowed the claim to be put on, and afterwards to be established or expunged, and he (the Registrar) was at a loss to understand how any possible injury could arise by such a course. If Mr. Bagley were urging his right to appear in the choice of assignees, there might be a question; but this was simply a notice on behalf of all the shareholders of the company.

Mr. LUCAS said the learned serjeant who had been instructed with him in the case thought the claim ought not to be admitted as having been engaged in a committee of the House of Commons, and when an inquiry was gone into as to the accounts of the company, he wished to show what state they were in.

The REGISTRAR said every one present was pretty well acquainted with the outlines of the case, and, if the company were seeking to prove for this large sum of money, it would be competent to the learned counsel to show that by their own neglect the company had contributed to the loss; but that was not the question now.

Mr. LUCAS said he proposed to take the opinion of the learned Registrar as to whether this claim should be put on the books, and when Serjeant Sargood arrived they would take the opinion of the commissioner.

Mr. BAGLEY said the question was one for the learned Registrar to decide, and not Serjeant Sargood.

The REGISTRAR said he should like to hear Serjeant Sargood himself, but in his absence he thought he was very ably represented by his junior. As he said before, if it was now sought to prove for the amount in question, the objection might fairly be urged that the company were bound first to prosecute the offender, and that they had contributed to the loss by their own neglect. But this was not the time to urge such an objection, and no injury could possibly arise from admitting the claim, which was simply a notice to the creditors.

The claim was admitted.

Several other proofs were tendered. One was by Mr. John Robinson Wells, surgeon, for £1137 18s. 6d., extending over a period of eight years, there having been payments on account; Messrs. Gibson Brothers claimed £1784,

on a building contract for £11,000; Mr. Krehl, the petitioning creditor, of whom the bankrupt borrowed £300 the morning before he absconded, &c.

Mr. Krehl and Mr. Elsam, surveyor, of Hampton (a creditor for £800) were appointed assignees, and an allowance was made to the bankrupt of £5 a week out of his estate for the support of himself and his family.

Mr. William Eley is the solicitor under the proceedings.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

1765.—ALFRED WILLIAMS, of 64, Bankside, Southwark, in the co. of Surrey, for "*Improvements in gas-stoves for cooking purposes.*" June 8, 1869.

1810.—JOSEPH HADLEY RIDDELL, of Cheapside, in the City of London, for "*Improvements in joints or connexions for uniting and securing together the ends of pipes or tubes.*" June 12, 1869.

1816.—EDWARD GRIFFITH BREWER, of 89, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improvements in connecting pipes or tubes.*" A communication. June 14, 1869.

1818.—JOHN TAYLOR, of 27, Russell Street, Bermondsey Street, S.E., engineer, for "*A floating and sliding top for wells, tanks, cisterns, or any other kind of vessel for keeping or holding water, fermented or unfermented, or any other kind of liquor.*" June 14, 1869.

1858.—BRISTOW HUNT, of 1, Serle Street, Lincoln's Inn, in the co. of Middlesex, gentleman, for "*An improved apparatus for ventilating and purifying rooms or apartments.*" A communication. June 16, 1869.

GRANTS OF PROVISIONAL PROTECTION.

849.—JAMES DARSIE MORRISON, residing at 27, Grange Road, Edinburgh, in the co. of Mid Lothian, N.B., surgeon dentist, for "*Improvements in heating and ventilating buildings and ships by apparatus for warming, circulating, and purifying air and water, and for employing the same as sanitary agents; also applicable for cooking purposes.*" March 20, 1869.

1629.—JOHN SNAPE, of Mountain Ash, near Aberdare, South Wales, mechanical engineer, for "*Improvements in pumps.*" May 27, 1869.

1637.—CHARLES PLUMB, of 21, Commercial Road, Lambeth, in the co. of Surrey, engineer, for "*An improved ratchet-brace, combining boring, tapping, screwing, and cutting-off apparatus.*" May 28, 1869.

1715.—JOHN LLOYD, engineer to the Lilleshall Iron Company, near Shifnal, in the co. of Salop, for "*Improvements in the construction of fans for ventilating.*" June 3, 1869.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF A COMPLETE SPECIFICATION.

1711.—CARL OSTLUND, of Stockholm, but at present of 2, Chiswell Street, Finsbury Square, in the co. of Middlesex, for "*Improvements in lamps for heating and lighting purposes, and in apparatus appertaining thereto.*" June 3, 1869.

NOTICES TO PROCEED.

243.—WILLIAM ROBERT LAKE, of 8, Southampton Buildings, Chancery Lane, in the co. of Middlesex, consulting engineer, for "*Improvements in ventilating apparatus.*" A communication. Jan. 26, 1869.

276.—GEORGE HAWKSLEY, of Montrose Villas, Caledonian Road, in the co. of Middlesex, engineer, for "*Improvements in the manufacture of ventilators and chimney-pots.*" Jan. 29, 1869.

282.—GEORGE HAWKSLEY, of Montrose Villas, Caledonian Road, in the co. of Middlesex, engineer, for "*Improvements in pumps and in apparatus connected therewith.*" Jan. 29, 1869.

357.—JOHN PAGE, of Glasgow, in the co. of Lanark, N.B., civil engineer, for "*Improvements in pipe-joints and in cement for the same; also suitable for cementing other articles, such as building materials.*" Feb. 5, 1869.

428.—JOHN CARTER, of Birmingham, in the co. of Warwick, boat-builder, for "*Improvements in water-closets.*" Feb. 10, 1869.

444.—FRANK CLARKE HILLS, of the Chemical Works, Deptford, in the co. of Kent, manufacturing chemist, for "*Improvements in the furnaces of gas-retorts, and in means and apparatus for effecting the combustion of fuel in the said furnaces.*" Feb. 12, 1869.

561.—BARNARD WILLIAM FAREY, of the firm of B. Donkin and Co., of Bermondsey, in the co. of Surrey, engineer, for "*Improvements in the seatings or facings of gas-valves.*" Feb. 23, 1869.

651.—WILLIAM EDWADD NEWTON, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improvements in the construction of water-closets.*" A communication. March 3, 1869.

1209.—WILLIAM EDWARD GEDGE, of the firm of John Gedge and Son, of 11, Wellington Street, Strand, in the co. of Middlesex, patent agent, for "*An improved water-meter.*" A communication. April 20, 1869.

1429.—JOHN WITHERS, of Handsworth, in the co. of Stafford, for "*Improvements in water-meters.*" May 10, 1869.

1711.—CARL OSTLUND, of Stockholm, but at present of 2, Chiswell Street, Finsbury Square, in the co. of Middlesex, for "*Improvements in lamps for heating and lighting purposes, and in apparatus appertaining thereto.*" June 3, 1869.

PATENTS WHICH HAVE BECOME VOID BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1470.—BALDWIN FULFORD WEATHERDON, "*Improvements in gas pyrometers, which may also be employed as thermometers.*" May 26, 1866.

1516.—EDWARD TAYLOR BELLHOUSE and WILLIAM JOHN DORNING, "*Certain improvements in hydraulic pumps, and in valves connected therewith, and also in the method of driving or actuating such pumps.*" May 31, 1866.

1525.—HENRY EDWARD NEWTON, "*Improvements in the construction of water-cocks or hydrants.*" May 31, 1866.

1552.—DESIRE ALFRED DUMUIS, ELMER JEAN FRANÇOIS FLICOTEAUX, EDWARD WILLIAM NIBLETT, and MANUEL LEOPOLD JONAS LAVATER, "*Improvements in water-closets, urinals, lavatories, and other receivers; and also in taps for supplying liquids to the same.*" June 5, 1866.

PATENTS WHICH HAVE BECOME VOID BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1551.—WILLIAM ROBERTS and THOMAS GREENACRE, "*Improvements in cocks or valves for steam or other fluids.*" May 22, 1862.

1714.—JAMES LOVEGROVE, "*Improvements in apparatus for inspecting small sewers and drains, and for facilitating the removal of obstructions therein.*" June 9, 1862.

Miscellaneous News.

BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from page 472.*)

The HON. SECRETARY read the following list of applications for membership which had been submitted to the committee:—

ORDINARY MEMBERS.

Braddock, J., Gas-Works, Droylesden.
Brothers, H., Equitable Gas-Works, Lupus Street, Pimlico.
Burton, D., Gas-Works, Ossett, near Wakefield.
Clark, D., Gas-Works, Brymbo.
Coulson, J. B., Independent Gas Company, 236, Kingsland Road.
Crookenden, I. A., Phœnix Gas Company, 69, Bankside.
Darwin, J. M., Gas-Works, Longton.
Eadington, J., Gas-Works, Blyth.
Emmerson, W. B., Gas-Works, Portadown, Armagh.
Fennessey, R. J., 18, St. Helen's Place, London.
Field, A., Widnes, near Warrington.
Gardiner, R., Elswick Engine-Works, Newcastle-on-Tyne.
Gore, H., 20, Alfred Place, Bedford Square, London.
Green, H., Gas-Works, Preston.
Hale, J., Gas-Works, Ballymena, Ireland.
Harding, G., Broad Green, near Liverpool.
Harris, —, Gas-Works, Ross.
Hislop, L., Equitable Gas-Works, Woolwich.
Holmes, W. C., Iron-Works, Huddersfield.
Hunter, S., Gas-Works, Louth.
Jameson, J. M., Gas-Works, Fleetwood.
Jones, E. E., Gas-Works, Knutsford.
Little, R., Gas-Works, Billingborough.
Lyne, J., Gas-Works, Wexford.
M'Millan, J., Gas-Works, Newry.
M'Nie, J., Gas-Works, Londonderry.
Martin, M., Gas-Works, Drogheda.
Marsland, J., Gas-Works, Enniskillen.
Mead, C. R., Wray Park, Reigate.
Melling, T., Gas-Works, Rainhill.
Mellor, T. R., 127, Leadenhall St., London.
Moor, W., Hetton Colliery, near Fence Houses.
Penny, A., 21, Wharf Road, City Road, London.
Phillips, A. F., Gas-Works, St. Albans.
Plumbe, W. A., Gas-Works, Sutton-in-Ashfield.
Prescott, W., Gas-Works, Prescott.
Rafarel, W. C., Gas-Works, Barnstaple.
Reid, J., Gas-Works, Newcastle-on-Tyne.
Romans, W., 1, Walbrook, London.
Smith, J. R., Gas-Works, Padiham.
Tindall, J., Gas-Works, Wakefield.
Tinney, W. U., Gas-Works, Winchester.
Upward, A., Chartered Gas Company, 146, Goswell Road, London.
Varley, T., Gas-Works, Colne.
Venner, B. G., Gas-Works, Eton.
Waugh, J., Gas-Works, Southport.
West, J., Gas-Works, Maidstone.
Wilkinson, P. H., Gas Company, Harrogate.
Young, J., Gas-Works, Stoke-on-Trent.

EXTRAORDINARY MEMBERS.

Cutler, S., jun., Providence Iron-Works, Millwall, London.
Rait, G., Gas-Meter Company's Works, 238, Kingsland Road, London.
Spence, J. B., Earlington House, near Manchester.

It was then unanimously resolved that the gentlemen whose names have just been read be elected members of the association.

Mr. WARNER (South Shields) said there was one subject to which the president had not alluded, but to which the attention of the association was specially drawn at the last meeting by Mr. Barlow, the ex-president—*i.e.*, the creation of a Gas Managers Benefit Fund, for the relief of deserving members who may be incapacitated by old age or sickness from discharging their duties. It might be that the president had not alluded to the matter in his address because both he and the committee might be waiting for some action to be taken on the part of the members of the association. He (Mr. Warner) would suggest that the words of the ex-president be adopted as a resolution, and that a sub-committee, consisting of the president, ex-president, and the president for the coming year, be appointed to consider the best means for giving effect thereto, and to report to the next annual meeting upon the formation of such a fund. This subject was not a new one; it was referred to some two or three years ago at the meeting of the association in London, by Mr. Hunter, and special attention had been more than once directed to it in the JOURNAL OF GAS LIGHTING. On the 19th of February, 1856, Mr. Barlow wrote: "Unfortunately, the number of instances which have come under our notice of the necessity for some such institution is so great that we feel it our duty to call the serious attention of our colleagues to the question. There are benefit societies amongst those whom it is the fashion to call the working classes, not only of engineers, but of almost every other trade. Travellers, licensed victuallers, artists, literary men, and actors have very wisely and very charitably combined together to relieve the wants of those of their members whom age or suffering, or 'the thousand ills that flesh is heir to,' have deprived of the means of supporting themselves. It is strange that engineers should not in their turn have felt it necessary to adopt some such measure long ere now, especially as the nature of the pursuit is one which is not only dangerous from its exposure to accident, but also on account of the fearful manner in which it taxes the mental and physical powers of its followers. We can assure our readers that we shall be anxious to co-operate in any attempt to remove what we consider to be somewhat in the nature of a reproach to our profession." He (Mr. Warner) now appealed to the members of the association on behalf of their decayed brethren, and the widows and orphans of those who had died in indigent circumstances, that this reproach should no longer rest upon the profession. In June, 1862, the Editor of the JOURNAL, referring to a very painful case, said: "The recent effort to raise a fund for the benefit of the widow and grandchildren of the late Samuel Clegg discloses in a marked manner the want of a provision for the relief of aged and decayed officers, who have been engaged for a great part of their lives in the manufacture and distribution of gas. Nearly every trade has established benevolent institutions in our large cities, but as yet the gas trade has done nothing of the kind, and its members, when unable to support themselves, or to obtain assistance from their friends, have no other resource than the workhouse," &c. He earnestly hoped that this association would take the matter up, and with that view he moved a resolution in the terms before stated.

Mr. A. O. ATKINSON (Hull) seconded the resolution, and said Mr. Warner had so well introduced the subject that it was quite unnecessary for him to add a word. He would only, therefore, express his satisfaction that the question was brought before the association, and his hope that the resolution would meet with the general approval of the members.

Mr. ANDREWS (Swansea) thought that in a matter of such vast importance, involving as it did all the members of the association, a proposition of this description should have been in its turn laid before the committee for consideration, so that they might have come before the general meeting with a recommendation. With this view he would purpose as an amendment—"That

notice be given to the secretary of an intention to move in the matter at a future day."

Mr. METHVEN (Bury St. Edmund's) seconded the amendment.

Mr. WARNER did not see how he could have given any notice on the subject, because he apprehended, after the remarks made by the president on the last occasion, that the members were looking to the committee for some action thereon.

The PRESIDENT said he ought to state that the subject had had the attention of the committee from time to time. The association at present was only in its infancy, and it was thought it had hardly arrived at such a stage as to justify steps being taken to establish such a fund as Mr. Warner referred to. However, it was a question which he was sure every member of the committee would desire to see most fully and attentively considered, and acted upon to the fullest extent possible, and if the resolution should be passed they would take care to organize some plan to carry out the wishes of the association before the next meeting.

On a show of hands the amendment was put, and carried by a large majority.

At a subsequent stage of the proceedings, Mr. Warner gave formal notice for a motion on the subject at the next annual meeting.

Mr. GEORGE ANDERSON, of London, read the following paper:—

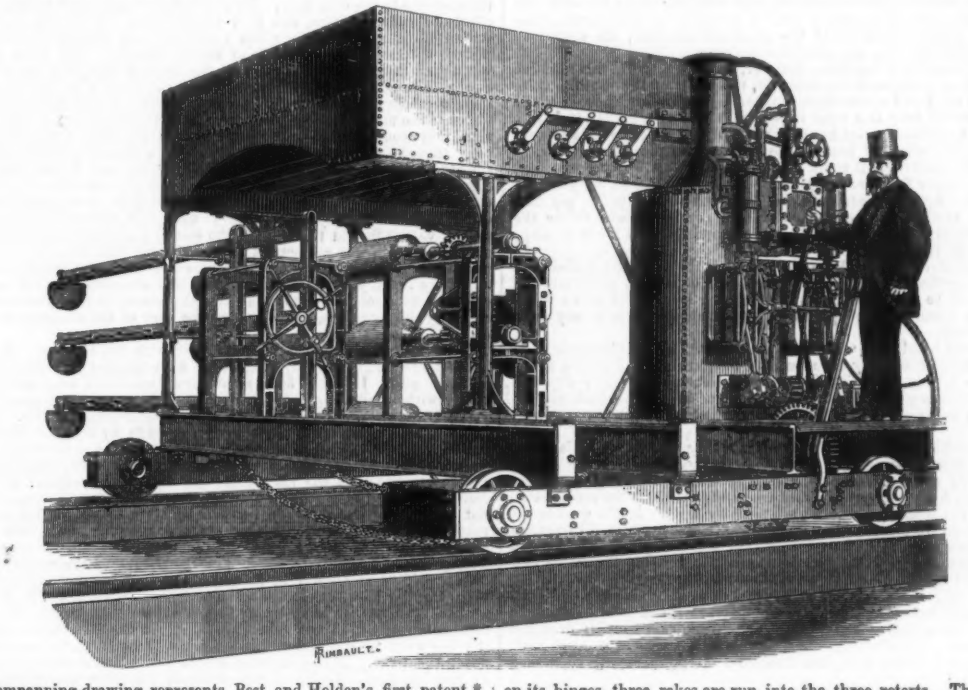
CHARGING AND DRAWING OF RETORTS BY MACHINERY.

Perhaps no manufacture, the creation of the present century, has derived less aid from machinery than that of the manufacture of gas for lighting purposes. I think that this is rather a humiliating statement for us gas managers and engineers. It cannot be that the question is not of sufficient importance, because there is not a town in the kingdom of any magnitude where the process is not carried on.

It cannot be that the process is irregular, and therefore not adapted to machinery; or intermittent, and that therefore machinery only partially employed would be too expensive, for the process of gas-making may almost be called fixed. The retorts are always in the same position, and they require to be charged and discharged always in the same manner, always in the same *locale*, and at fixed and regular intervals of both day and night and all the year round; and it is in the retort-house that the greater proportion of the labour is performed.

It cannot either be because the charging of retorts with coal, and especially the discharging of them of red-hot coke, is a process delightful to the men, for a more fatiguing, dirty, ungenial occupation scarce exists in the whole round of manual labour, nor one that so soon makes old men out of young ones; and when we know that the process thus described cannot even be discontinued on Sundays, I think that the man who shall successfully apply the strong arm of steam, that never falters or becomes weary, to the working of retorts, in place of the human limb whose joints so soon become stiff and rheumatic, will earn the thanks of all concerned, from the men to their masters.

I dare say the idea has occurred to many. I know that one of our members of council and I discussed the question some twelve years ago, and doubtless many members present will be prepared to give their remarks on what they have thought and done, and their reasons for not going further, for already the "charging" and "drawing" of retorts has been accomplished, and, so far as I know, we are indebted to mechanical engineers for showing us how to perform this portion of our duties. Already three patents have been taken out for working retorts by steam power.



The accompanying drawing represents Best and Holden's first patent.* The machine was intended to draw and charge three retorts at a time. Each had its separate lid, which it was proposed to make gas-tight by a surface joint. A second patent was taken out by the same parties, the peculiarity of which consists in forming the mouths of three retorts into one chamber, with one door and one rising-pipe for the three; and according to this arrangement the machine has been adopted at the Alliance Company's new works at Dublin. This machine, however, has one serious objection to its general adoption. It charges three retorts at a time, and it requires that the position of these retorts shall have their mouths vertically over each other. It also requires that the whole of the retorts in the setting shall be in the same fixed positions. Consequently, before the machine can be adopted all the retorts must be set to suit it. It also requires the retorts to be set on a stage—a system which few engineers like, if they can avoid it, for many reasons not necessary to mention to an audience where the subject is perfectly understood. The upper three retorts require also to be at a very great elevation; too high to be charged by hand, should the machinery get temporarily deranged, thus necessitating a machine to be always in readiness, though seldom worked; an expense that could not be borne unless in works of unusual magnitude.

In connexion with this machine, though only incidentally so, the mouths of the retorts were of an unusual and very expensive construction. Vertically the retorts were connected in sets of three, with one door and one rising-pipe. Considerable difficulty was felt in keeping those doors perfectly gas-tight, as may be imagined, where they were expected to be so by merely planed surfaces, without any luting, and exposed as they were not only to considerable heat, and therefore unequal expansion, but to any alterations which might take place in the shape of the brickwork of the settings to which they were firmly attached; but as this form of door is only incidental to the machine, its merits or demerits have nothing to do with the principle of retort-charging by machinery, and I only mention it as a part of the history of the introduction of this invention.

In this machine the scoops are filled by mechanical means simultaneously from a hopper carried on the same framing as the machine, and as the size of the "charges" according to the temperature of the retort cannot be regulated, this may by some be considered a drawback to its use. The action of the machine is as follows:—The door of three retorts being swung open on its hinges, three rakes are run into the three retorts. These rakes are each provided with a jointed hoe at their point; when the rakes have reached their full distance into the retorts the hoes are made to fall down, when a reverse action is given to them, which brings the whole charge out at one haul. The machine is now traversed about 3 feet, which brings the scoops, already filled, opposite the retorts; they are run in, tilted, and withdrawn. The machine is further traversed about 3 feet, the lid is swung to, having been brushed on the inner face with a little melted grease, and closed by driving up two wedge-shaped cross-bars into correspondingly shaped lugs, and the process is finished, occupying about three minutes.

The retorts which the patentee recommends are about 18 inches in diameter, circular, and in retorts of this dimension the drawing and charging of through and through retorts were performed satisfactorily. Whether in wide ovals and D retorts as satisfactory results could be obtained, is yet a matter of opinion on which engineers may fairly differ.

I am indebted to Mr. Stevenson, the secretary of the company, one of our members, for the following statistics of last winter's working:—The No. 1 retort-house of No. 2 station, as worked last winter by the steam-stoker, consisted of 19 beds, of 9 retorts in each, making a total of 342 mouthpieces, each retort 20 feet long and 18 inches in diameter, the whole of which were worked by the machine. Each machine is worked by four men, viz.:—

1. The engine-driver	at	£1	6	0	per week.
2. The rakesman	,,	1	5	0	,, ,,
3. The fireman	,,	1	2	0	,, ,,
4. The hopperman	,,	0	17	6	,, ,,
		£4	10	6	

Making a total of £18 2s. per week for working the two machines, one on each side of the bench, day and night. The engine-man drives the machines, and is the man in charge of the various parts of it, and is responsible for the proper drawing and charging of the retorts. The rakesman opens and closes the doors, and manages the rakes or hoes for drawing the coke. The fireman fires the boilers, scrapes and cleans the doors, and works the chains used for opening and shutting the valves which control the dropping of the coals from the hopper into the scoops. The hopperman receives the coal into the hopper, and trims it into the coal measures, leaving it ready for the fireman to lower it into the scoops.

The machine will draw and charge a bed of nine retorts in nine minutes. The scoops are made to contain 3 cwts., but, taking the general work, 21 cwts.

* We are indebted to the courtesy of the editor of "*Engineering*" for the above sketch.

per retort is the maximum put in by it, giving 2¼ per scoop, or 5½ cwts. per charge for a retort through and through, making for the whole house, as worked last winter, 179 tons 11 cwts. per diem, say 1257 tons per week, at a cost for driving the machines of £18 2s.; or the drawing and charging of the retorts would be done when the carbonization amounted to the above quantity, at the rate of 3·45 of a penny for wages.

The house when completed will consist of 28 beds of nine and one of six, the whole of which the patentees consider will be worked next season on six hours charges by the present machines. The cost of one machine is about £700, and the royalty 9d. per ton of coal carbonized.

Assuming that the house when completed will, as Mr. Stevenson is led to expect by the patentees, work the 29 settings of 258 retorts, and reckoning 5½ cwts. to a charge, as given in the foregoing statistics, and six days full working of the whole as a week's work, we have 1625 tons of coal carbonized weekly. The cost of carbonizing may be taken somewhat as follows:—

	£	s.	d.
Labour, as before	18	2	0
Fuel for steam-boilers, say 7 tons, at 18s. per ton	6	6	0
Oil and cotton waste, &c.	0	10	0
Wear and tear and maintenance of machines	7	0	0
	£31	18	0

Which at 9250 feet of gas per ton gives a labour account of $\frac{5}{100}$ of a penny.

This calculation is made under the most favourable circumstances to the machine—namely, in a retort-house where it will have full duty, and without any allowance for its breaking down; and this contingency is considered so likely, that in Dublin, I understand, they intend having one or two spare machines. In the latter case, the capital invested will be, for machines, above the sum of £2800.

Bringing the coal into the retort-house, and wheeling away the coke and firing the furnaces, being similar to what it would be by hand labour, they have not been taken into either of the above calculations; the work done merely consisted of drawing and charging the retorts.

There is one element of expense, however, connected with this machine which should have been included—namely, the whole of the coal has to be raised a height of 15 feet above the retort-house floor into the hopper of the machine, and as the floor is a stage one—say 10 feet above what it is in a house without a stage—the coal has thus to be lifted a height of 25 feet over what would be necessary by hand labour. This I consider is worth 3d. to 4d. per ton. By machinery it could doubtless be done for less money; but, taking it at the lower figure of 3d., we have the sum of £20 6s. 3d. per week for coal-lifting. Again, we are informed that the royalty is 9d. per ton. This apears an extraordinary charge, which, if continued, will excite the ingenuity of others to produce a better machine and charge a lower royalty; but we must take it as we find it.

When we consider that it is impossible to work the machines to their full capacity for more than a few months in the depth of winter, while much of the expense will be a constant sum that cannot be reduced as we would reduce manual labour, there appears by this machine little if any commercial advantage.

The last patent to which I will refer is represented by the photographs on the wall. This machine has yet to earn its reputation. It has been manipulated at the factory, much as our reserve fleet was the other day, and report speaks of it as a success. It is easily and accurately handled, and one of them is now being erected near London, of which, doubtless, we may hear more.

This last machine is only adapted to charge one retort at a time; no alterations of retort-settings are required. It does not, like the one at Dublin, carry its steam-boiler, but receives its steam from a pipe run along the retort-house from a stationary boiler. In this machine the scoops come to the level of the stage or floor, and are filled by hand. In the machine at Dublin the scoops are filled from hoppers above. This machine is suspended from girders overhead, and the whole of the machinery moves backwards and forwards in doing its work. In the one at Dublin only the scoops and rakes move, and the machine rests on rails laid on the stage or floor.

The Dublin machine seems better adapted to works on a large scale, the other to works of moderate size; but whether it will be able to compete with manual labour, unless where that is scarce, and consequently dear, has yet to be proved. Mechanical ingenuity seems sufficiently awakened. Several parties are in the field, and doubtless the problem will be worked out.

It appears to me, however, that the machine for general use has yet to be designed; that it must carry at least two scoops; that these must be so fitted as to move into a position horizontal, perpendicular, or at any angle to each other, enabling them to charge the retorts as at present set; and they must do it at least as rapidly as it can be done by hand.

Mr. ANDERSON added that, since the paper was prepared, he had learned that the details from Dublin were not so explicit as they should be. The expression, "royalty, 9d. per ton," he was now informed, meant also the labour for working the machines. The model of the apparatus last named in his paper had only been seen by him since the meeting began, and therefore he could furnish no information about it; but the inventor, Mr. Dunbar, was in the room, and would probably like to give some further explanation.

Mr. DUNBAR explained the models of the hand and steam worked machines on the table. He said the principle of the invention was that of having only one machine instead of two, the scoops for feeding the coal into the retorts containing also the rakes for withdrawing the coke at the end of the charge. In the first patented machines the rakes had to force their way through the coke; in this, the rakes or hoes were disposed longitudinally in bearings fitted inside the scoop. In withdrawing the coke the scoop was introduced in an inverted position into the retort, so that the back of the scoop came against the top of the retort, and, by the action of the handwheel and gearing, the rakes were turned round, and caused to cut off the coke in sections, so that it was readily drawn out. The machines of which these were models were designed for existing gas-works, where the coal was put on the floor. A machine for charging more than one retort at a time could not be designed while the retorts were in different settings.

Mr. ANDREWS asked what was the relative time occupied in charging a bed of retorts by machinery of that description in comparison with hand labour, one retort at a time.

Mr. DUNBAR said by this machine a retort could be charged in four seconds. Of course there was, in addition, the time required for filling the scoops, which was the same as usual.

Mr. METHVEN inquired whether there was not sometimes a difficulty in getting the rakes over the top of the coke.

Mr. DUNBAR said there was not, because the rakes were low down in the scoop, and passed clear over the coke.

Mr. METHVEN said that might be so when retorts were new, but when carbon grew on the roofs it would not be so easy.

Mr. WARNER thought a secondary advantage of the machine might be that it helped to clear the way itself.

Mr. DUNBAR said another great advantage in charging only one retort at a time was, that the temperature of the furnace did not get so much reduced. In answer to an inquiry he said the cost of the steam machine was £250.

Mr. COPLAND (Hull) said that when in London he saw Best and Holden's machine. The conviction it produced on his mind was that it professed to do too much, and he thought all the machinery at present devised had that objection. The great difficulty which gas managers had to contend with was the handling of the heavy material; what they required most was some contrivance for taking off the strain from the workmen as much as possible, and he believed, if they could get a machine to do that work effectually, they would have all that they required. The difficulty in drawing retorts was the jumping up of the coke itself. He feared almost all the machinery at present invented was too complicated.

Mr. DUNBAR said by his machine he could draw the coke so as not to leave a piece as big as a marble.

Mr. COPLAND said that might be so at first. He was of opinion that, though they might take the coke out by machinery, they must continue to charge by hand.

Mr. H. JONES (London) said that in some works which he had in charge they had, for the last five or six years, used a simple machine for lifting the scoop, and supporting it on the face of each retort, with considerable economy of labour.

Mr. STEVENSON (Dublin) thought Mr. Anderson had said so much and spoken so well on the subject that it left him little to add. The machine of Best and Holden, so far as his experience went, was doing its work most satisfactorily. Mr. Copland thought the great advantage of the machine was in the drawing, but he could assure him they found its greatest disadvantage there, and that the coke was rather damaged in its transit from the machine to the coke floor. No doubt there was a great saving of labour effected by the machine, and if it possessed no other value than that of emancipating managers from the annoyance and trouble they often experienced with stokers, it would be of infinite benefit. Two years ago there was a good deal of agitation amongst this class of men, and one of the principal results of the combination amongst the stokers in Dublin was that the gas company was served with a notice that, unless they increased the wages of the men 5s. a week, and gave them the advantage of another set of men, they would turn out. During the agitation which prevailed, the company thought they would not be justified in incurring the grave responsibility of possibly leaving the city in darkness, and rather than do that they submitted to the imposition. By the introduction of machinery of the class now under consideration they would be able, in a great measure, to cope with this difficulty in the future. Certainly, the experience of Dublin proved that it tended to diminish the cost of production, and so must be of great benefit to gas companies. Mr. Anderson had referred to the cost of the machine and royalty. It was quite true that the royalty and wages amounted to 9d. per ton; but there was this advantage, as far as the gas company were concerned, that the capital invested in the machine was produced by the patentees, and whatever the cost of the machine, it was their cost, not that of the company.

Mr. WARNER said he did not quite agree with Mr. Copland. He thought there should be no practical difficulty in both drawing and charging retorts by machinery. It would be a great advantage if the coke could be withdrawn without allowing it to fall upon the ground, and so become broken.

Mr. ROMANS said the secretary of the Dublin Company (Mr. Stevenson) had informed the meeting why they first came to try Best and Holden's machine—viz., the combination among the stokers. As to the working of the machine, he might add that there had been no difficulty experienced with the scoops, but with the rakes there had been some trouble. He was perfectly sure that in the other machine referred to, if some improvement were not made, the rakes, as shown in the model, would not work a week. The rakes in Best and Holden's were small and strong, but, with all their strength, they had frequently to be renewed. It had been suggested that damage would be done to the tops of the retorts by the scoops. This had been overcome at Dublin by having a cast-iron bar made to hinge on the top. On the back, where it came in contact with the retort, it was made knife shaped, so that it scaled as well as drew out the coke. There was no such arrangement in the other machine. In the first machine at Dublin the bar went in straight, and a screw at the end of the machine forced down the pawl. The pawl got so heated that sometimes they were obliged to give up work. They had now reversed the screw arrangement so that the pawl was pulled down, and he thought they would get over the difficulty. Even if the machine did not in practice perform the work which was claimed for it, there could be no doubt that it effected a great saving in labour. Next winter the coal-lifting and removal of the coke in the works at Dublin would be entirely done by machinery.

Mr. CATHELS said Mr. Stevenson had expressed his opinion that the machine would relieve managers from the annoyance of threatened strikes. He was afraid there was a greater probability of a strike amongst skilled labourers, such as those who would work machinery, than amongst stokers.

Mr. ANDERSON said the objection that the drawing out of the coke by the rake would injure the retort was much more likely to exist in the machine in which the rake was at the far end of the shaft than in the one exhibited by Mr. Dunbar, where there were several rakes or hoes biting the coke at distances of two or three feet, and each one doing its own work. In this respect he thought the latter was superior to the first-named machine.

Mr. ROMANS said they had tried with three bars instead of one, and found it disadvantageous in the difficulty of bringing out the coke.

(To be continued.)

DR. WHITMORE'S REPORT ON THE QUALITY OF THE WATER SUPPLIED IN ST. MARYLEBONE, IN MAY, 1869:—

MAY.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	May, 1868.	May, 1869.	May, 1868.	May, 1869.	
Distilled Water . . .	0°	0°	0°	0°	0°
West Middlesex water	16·64	17·20	0·56	0·64	—
Grand Junction water	17·52	17·36	0·60	0·64	—

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

The water supplied to the parish by the two Thames companies maintains its usual degree of purity and brightness, notwithstanding that the rainfall has occasionally been considerable, at which times the water of the Thames

is always found to contain some little excess of solid matter in solution; how small that excess is may be seen by comparing the quantity of last month with that found in it in the corresponding month of last year, as shown in the above table.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE GAS SUPPLIED IN ST. MARYLEBONE, IN MAY, 1869:—

MAY.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity of Sulphur in 100 Cub. Ft.	Mean Quantity of Ammonia in 100 Cub. Ft.	Sulphuretted Hydrogen.
	* Mean of 24 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Company's gas . .	15·27	15·93	14·32	22·88	10·31	25·49	5·82	None.
Chartered Company's common gas	14·07	14·56	13·68	37·76	13·24	28·32	9·71	None.
Chartered Company's cannel gas	21·10	21·89	20·23	33·97	13·13	21·92	9·32	None.

Mean of daily readings of Barometer, 29·59
" " " Thermometer, 58·77

* Each observation consists of 10 readings of the photometer, at intervals of one minute.

The range in the illuminating power of the Imperial gas was from 15·93 candles to 14·32 candles; on nineteen occasions it exceeded 15 candles. The results of continuous experiments for sulphur and ammonia showed of the former a mean quantity amounting to 25·49 grains, and of the latter 5·82 grains in every 100 cubic feet of gas. The pressure was good, and on no occasion was sulphuretted hydrogen detected. The mean illuminating power of the Chartered common gas was equal to 14·07 candles; on one occasion it reached 14½ candles; but on ten occasions at was found to be below the standard as required by the City Gas Act of last session. The mean quantity of sulphur in 100 cubic feet of this gas was 28·32, and of ammonia 9·71 grains; no trace of sulphuretted hydrogen was detected. The mean light of the cannel gas was equal to 21·10 candles, its highest was nearly 22 candles, and on no occasion did it fall below the standard. The mean quantity of sulphur contained in it was 21·92 grains per 100 cubic feet, and of ammonia 9·32 grains. It was always perfectly free from sulphuretted hydrogen.

AVERAGE COMPOSITION AND QUALITY OF THE METROPOLITAN WATERS IN MAY, 1869.—The following are the returns of the Metropolitan Association of Medical Officers of Health:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Comps.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction. . . .	19·60	0·113	0·067	0·000	14·9	3·5
West Middlesex . . .	18·07	0·070	0·083	0·000	13·8	3·5
Southwark and Vauxhall.	17·04	0·108	0·105	0·004	14·0	3·3
Chelsea	18·03	0·103	0·120	0·006	14·8	3·7
Lambeth	17·33	0·054	0·165	0·002	14·0	3·2
Other Companies.						
Kent	26·77	0·038	0·178	0·000	20·6	6·0
New River	16·33	0·032	0·075	0·000	14·0	3·3
East London.	18·90	0·054	0·090	0·000	14·3	3·5

Note.—The amount of oxygen required to oxidize the organic matter, nitrites &c., is determined by a standard solution of permanganate of potash acting for three hours; and, in the case of the metropolitan waters, the quantity of organic matter is about eight times the amount of oxygen required by it.

The average quantity of water supplied daily to the metropolis in the month of April last was, according to the returns of the water companies to the Medical Officers of Health, 97,313,153 gallons; and the number of houses supplied was 463,428. This is at the rate of 30·7 gallons per head of the population.

H. LETHEBY, M.B.

DR. STEVENSON'S REPORT ON THE GAS SUPPLIED BY THE IMPERIAL COMPANY TO THE VESTRY OF ST. PANCRAS DURING THE MONTH OF MAY, 1869:—

Date.	Number of Observations.	Average Light in Candles produced by 5 Ft. of Gas per Hour.	Light in Candles reduced to Consumption of 120 Grs. per Hour.	Traces of Ammonia.	Traces of Sulphuretted Hydrogen.
May 3	10	12·7	13·4	Present.	None.
5	10	13·9	14·2	"	"
11	10	12·9	13·8	"	"
13	10	14·2	13·9	"	"
15	10	13·5	13·6	"	"
18	10	13·6	14·0	"	"
20	10	12·3	12·8	"	"
20	10	13·5	13·5	"	"
22	10	13·2	14·0	"	"
25	10	13·6	13·8	"	"
27	10	13·4	13·6	"	"
29	10	13·6	14·2	"	"

The illuminating power of the gas ranged from 12·8 to 14·2 candles, the average being 13·7 candles. An illuminating power of 12 candles is required by the Gas Act of 1860. Ammonia was present on every occasion on which the gas was examined for this impurity; but sulphuretted hydrogen was as invariably absent. Sulphur was present to the amount of 13·4 grains per 100 cubic feet; 20 grains are allowed to be present by the Statute.

BILLINGBOROUGH AND HORBLING GAS COMPANY, LIMITED.—The sixth annual general meeting of shareholders of the above company was held at the works on Monday, the 7th inst., the Rev. J. Kynaston (in the absence of Henry Smith, Esq., the chairman of directors) in the chair. It appeared by the accounts that the receipts during the year, including a balance in hand at the beginning of £192 18s. 2d., amounted to £667 10s. 8d.; and the disbursements, including £80 paid for a dividend, and £75 12s. 6d. the balance of the debt due from the company to £405 8s. 2d.; leaving a balance of £262 2s. 6d. The report of the directors and the accounts were adopted, and it was unanimously resolved to apply the above balance as follows:—£50 towards a reserve-fund to meet any expenses for repairs or other heavy outlay; £120 in paying a dividend of £6 per cent.; leaving a balance in hand of £92 2s. 6d. for current expenses. During the first three years of the company's existence the shareholders received no dividend at all, the balance of the earnings being each year applied in paying off the money which the directors had to borrow.

DR. FRANKLAND'S ANALYSIS OF THE METROPOLITAN WATERS IN MAY, 1869.—"Royal College of Chemistry, May 26, 1869.—Sir,—I have the honour to submit to you in the following table the results of the chemical examination of the waters supplied to the metropolis during the month of May. For the purpose of comparison I append also the results yielded by the waters supplied to the towns of Edinburgh, Newcastle, Glasgow, Manchester, Preston, Lancaster, Bristol, and Dublin, and by samples of Thames water taken at London Bridge at low and high water; also by the water from the artesian well in Trafalgar Square. The Southwark Company delivered turbid water; the Grand Junction Company's sample was slightly turbid; the waters from the mains of the Chelsea, West Middlesex, Lambeth, New River, East London, and Kent Companies were clear and transparent. The suspended matter of the turbid samples was full of living organisms.

Companies.	Date and Place of Collection.	Temperature in Centigrade Degrees.	Total Solid Impurity.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Previous Sewage Contamination (Estimated).	Chlorine.	Total Hardness.
Thames.											
Chelsea.....	May 10—Cab Rank, Horse Guards.....	13·9	26·96	·266	·024	·001	·216	·241	1850	1·73	22·5
West Middlesex	May 10—Cab Rank, Portland Road..	14·2	26·52	·165	·016	·001	·176	·193	1450	1·70	22·2
Southwark & Vauxhall..	May 10—Cab Rank, Saint George's Ch.	15·0	27·06	·273	·035	·001	·207	·243	1760	1·70	23·4
Grand Junction.....	May 10—Cab Rank, Woodstock Street.	13·3	26·84	·269	·029	·002	·208	·239	1780	1·71	22·9
Lambeth....	May 10—Cab Rank, Lambeth Road..	13·6	27·64	·279	·024	·001	·252	·277	2210	1·84	23·2
Other Sources											
New River...	May 10—Cab Rk, Tottenham Ct. Rd.	13·9	26·60	·117	·016	·001	·204	·221	1730	1·64	24·1
East London.	May 11—Slater's, Old Ford Road.	13·6	28·86	·120	·023	·001	·184	·208	1530	1·77	24·5
Kent.....	May 11—Deptford Bridge Police Statn.	13·3	41·34	·052	·008	·000	·377	·385	3450	2·38	31·4
Edinburgh Waters.											
Crawley Burn	Sept., 1868.		11·28	·187	·031	·001	·000	·032	0	1·042	6·1
Comiston Wr.			22·58	·085	·017	·001	·744	·762	7124	1·886	10·4
Swanston Wr.			12·70	·378	·059	·001	·000	·060	0	1·390	6·2
Colinton Wr.			14·10	·203	·042	·000	·000	·042	0	0·894	9·2
Newcastle...	September ..		23·40	·237	·062	·000	·000	·062	0	1·588	13·9
Loch Katrine	July, Glasgow		3·00	·161	·011	·001	·000	·012	0	·995	0·3
Manchester..	June.....		6·20	·183	·009	·006	·025	·039	0	1·117	3·7
Preston	August.....		12·44	·236	·031	·006	·000	·036	0	1·590	8·9
Lancaster ...	November...		4·58	·129	·022	·001	·000	·023	0	·993	·87
Bristol	Feb., 1869—Water-Works		28·66	·160	·017	·001	·203	·221	1720	1·3	24·46
Dublin	April, 1869—Water supply		6·34	·238	·024	·001	·000	·025	0	1·24	2·97
Thameswater filtered....	April 27, 1869, Lond. Bridge, mid-stream at low water		30·35	·455	·075	·032	·161	·282	1750	1·95	22·7
	at high watr		92·85	·540	·122	·025	·304	·537	3830	31·5	23·9
Artesian well water	May 6, 1869—Trafalgar Sq. London.....		83·4	·150	·012	·070	·000	·079	260	16·55	5·92
Column 1	2	3	4	5	6	7	8	9	10	11	12

The numbers in columns 4, 5, 6, 7, 8, 9, 10, 11, and 12 all relate to 100,000 parts of the waters. The table is to be read thus: The Chelsea Company's water collected on the 10th of May, at the Horse Guards cab rank, had a temperature of 13·9° Cent.; 100,000 lbs. of it contained 26·96 lbs. of solid impurity; the organic matter, constituting a portion of this impurity, contained ·266 lb. of carbon and ·024 lb. of nitrogen. This solid impurity also contained ·216 lb. of nitrogen in the form of nitrates and nitrites, besides ·001 lb. of ammonia, whilst the total amount of *combined* nitrogen in every form was ·241 lb. The above quantity of water supplied by the Chelsea Company had been, after its descent to the earth as rain, contaminated with sewage or manure matter equivalent to 1850 lbs. of average filtered London sewage. By gradual oxidation, partly in the pores of the soil, partly in the Thames and its tributaries, and partly in the reservoirs, filters, and conduits of the company, this sewage contamination had been converted into innocuous inorganic compounds before its delivery to consumers. The above quantity of water also contained 1·78 lb. of chlorine. Finally, 100,000 lbs. of the Chelsea Company's water contained 22·5 lbs. of carbonate of lime, or an equivalent quantity of other soap-destroying ingredients.—I have, &c., E. FRANKLAND.—The Registrar-General, &c."

Share List of Metropolitan Gas Companies.

Number of Shares issued.	Amount per Share.	Name of Company.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Price per Share.
	£		£ s. d.	£ s. d.	£
8000	10	Anglo-Romano	10 0 0	10 0 0	11 — 12
5000	20	Bahia (Limited)	20 0 0	3 0 0	13 — 14
1000	20	Do., preference	20 0 0	10 0 0	24 — 25
750	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	4 0 0	3¾ — 4¼
10000	5	Do., third issue	4 0 0	4 0 0	2¾ — 3¼
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge, & Holywell.)	20 0 0	10 0 0	30 — 31
12000	50	*Chartered*	50 0 0	4 5 0	46 — 46½
6060	50	Do.	45 0 0	4 5 0	41 — 41½
10000	20	*City of London*, A shares	20 0 0	8 0 0	23¾ — 24¼
10000	10	Do., B shares	10 0 0	4 0 0	6¾ — 7
9629	10	Do., new shares	10 0 0	8 0 0	11¾ — 12¼
17490	25	*Commercial*	25 0 0	10 0 0	35 — 36
20000	20	Continental Union	20 0 0	5 0 0	20 — 20¾
5213	20	Do., preference	20 0 0	7 0 0	20 — 20¾
5000	10	*Crystal Palace District*	10 0 0	10 0 0	13¾ — 14
5000	10	Do., preference	10 0 0	6 0 0	12¾ — 13
10000	10	Do., new shares	10 0 0	7 0 0	10¾ — 11
4000	50	*Equitable*	50 0 0	10 0 0	64¼ — 65¼
4000	25	Do., new shares	25 0 0	10 0 0	32½ — 33
23406	10	European (Limited)	10 0 0	11 0 0	14¼ — 15
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	11 0 0	7¼ — 7¾
20000	10	*Great Central Gas Consumers*	10 0 0	..	11 — 11½
5000	10	Hong Kong (Limited)	10 0 0	6 0 0	8 — 10
26000	50	*Imperial*	50 0 0	10 0 0	67 — 68
26000	10	Do., new shares	3 0 0	10 0 0	4¾ — 5
26000	12½	Do., new shares	3 0 0	7 0 0	3¼ — 3¾
1300	100	Do., bonds	£100	10 0 0	175 —180
28000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Stolberg, Toulouse, & Vienna.)	43 15 0	16 0 0	103 —104

Number of Shares issued.	Amount per Share.	Name of Company.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Price per Share.
	£		£ s. d.	£ s. d.	£
400	100	Imperial Mexican (Limited)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent*	40 0 0	10 0 0	51 — 53
3000	10	Do.	10 0 0	5 0 0	7 — 8
3000	20	Do.	15 0 0	7 10 0	15 — 16
7133	50	*London*	50 0 0	10 0 0	66½ — 67
5610	25	Do., 1st preference	25 0 0	6 0 0	26 — 28
503	50	Do., 2nd preference	50 0 0	6 0 0	
214	50	Do., 3rd preference	50 0 0	6 0 0	
£18781		Do., 1st preference stock		6 0 0	
£11828		Do., 2nd preference stock		5 0 0	
		Nictheroy, Brazil (Limited)			
15000	5	Malta and Mediterranean (Limited)	5 0 0	3 10 0	3¼ — 4
6000	5	Do., preference	5 0 0	7 0 0	4¾ — 5¼
30000	5	Oriental (Calcutta)	5 0 0	10 0 0	7¾ — 8
30000	5	Do., new shares	1 0 0	10 0 0	1¾ — 1¾
10000	5	Ottoman (Limited)	5 0 0	nil.	1¾ — 2¼
12500	10	Pará (Limited)	10 0 0	7 10 0	8¼ — 9
27000	20	*Phœnix*	20 0 0	10 0 0	27 — 27½
3800	100	Do., new	35 0 0	7 10 0	36 — 36½
144000	Stk.	Do.	100 0 0	5 0 0	73¼ — 74¼
5000	20	*Rateliff*	20 0 0	10 0 0	23¼ — 24¼
	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	24 — 25
6959	5	Singapore (Limited)	5 0 0	4 0 0	
2000	5	Do., preference	5 0 0	7 10 0	
		Shanghai			
4800	50	*South Metropolitan*	50 0 0	10 0 0	73 — 75
4800	12½	Do., new shares	12 10 0	10 0 0	18¼ — 19
15000	10	*Surrey Consumers*	10 0 0	10 0 0	13¼ — 13¾
10000	10	Do., new	6 0 0	10 0 0	8 — 8¼
9000	4	United General (Limerick)	4 0 0	5 0 0	2 — 2¼
10000	10	*Victoria Docks*	5 0 0	6 0 0	
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	10 — 12
1500	10	Do.	10 0 0	7 10 0	
1819	10	Do.	10 0 0	7 10 0	
1138	10	Do.	5 0 0	7 10 0	
20000	10	Western (Limited) A shares	10 0 0	10 0 0	14¼ — 15
10000	10	Do., B shares	7 0 0	10 0 0	9¼ — 10
10000	10	Do., C shares	7 0 0	10 0 0	9¼ — 10
20000	10	Do., D shares	1 0 0	10 0 0	1¾ — 2
8000	5	*West Ham*	7 0 0	7 10 0	7¼ — 7¼
6000	5	Do., new shares	7 0 0	7 10 0	
551	10	West London Junction (Limited)	10 0 0	6 0 0	
520	10	Do., preference	10 0 0	6 0 0	

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

½ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle and Middlesboro'.	Wales.	Yorkshire, Derbyshire, and Staffordshire
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	3 15 0	2 11 3	2 8 0	3 10 0	3 10 0
1½ and 2-inch Socket-pipes	7 0 0	5 15 0	5 10 0	6 0 0	7 0 0
2½ and 3-inch ditto	6 10 0	5 5 0	5 0 0	5 15 0	6 10 0
4 and 5-inch ditto	6 0 0	4 15 0	4 10 0	5 5 0	6 0 0
6 inches and upwards ditto	5 15 0	4 5 0	4 0 0	5 0 0	5 15 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 5 0	5 0 0	5 10 0
Ditto, 2nd ditto, cold ditto	6 10 0	—	—	—	6 10 0
Tank-plates, ¼ thick and above	6 0 0	5 0 0	4 15 0	5 10 0	6 0 0

WROUGHT-IRON TUBING,

Subject to 50 per cent. Discount.

	2 in.	1¼ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 14 feet—per foot	1 8	1 1	0 10	0 7	0 5	0 4½
Ditto ditto, from 12 in. to 23½ in.—each	3 0	2 0	1 6	1 1	0 9	0 8
Long Screws, from 12 in. upwards	4 0	2 3	2 0	1 6	1 2	0 11
Bends and Springs	4 3	2 3	1 9	1 3	0 11	0 8
Square Elbows, equal or reducing; Round Elbows, 5 per cent. extra	3 9	2 3	1 9	1 3	0 10	0 8
Tees, wrought or cast	4 6	2 6	2 0	1 6	1 1	0 9
Crosses, ditto, equal or reducing	4 9	3 6	3 0	2 3	1 9	1 6
Iron Cocks	20 9	13 0	10 0	7 3	5 0	3 8
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4½
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

GAS COALS.—*Per Ton.*

Newcastle.—Unscreened:—

	s. d.
Haswells, Nettlesworth Primrose, and South Pelaw	6 6
Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	6 9
Burnhope, Craghead, Chariaw, Derwent, East Castle, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	7 0
Pearth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	7 3
Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Pearth, Stella, Urpeth, Washington Hutton, and West Leverson	7 6
Ramsay's Newcastle Cannel	15 0
Wigan Cannel (at Liverpool)	17 0
Scotch Cannel:—	
Boghead—at Bo'ness, 38s.; at Leith	38 8
Muirkirk	27 0
Kirkness, best (at Burntisland)	28 6
Capeldrae, 1st quality (at ditto)	28 6
Ditto, 2nd ditto (at ditto)	18 6
Cowdenbeath	12 0
Lesmahago (at Glasgow)	31 6
Ditto (at Granton)	32 6
Arniston	27 6
Wemyss, f.o.b.	22 6
Haywood, Wilsontown (at Granton)	23 0
Pirnie, or Methill	17 0
Lothian's Cannel (f.o.b. at Leith)	26 0
Bo'ness Cannel (at Bo'ness)	19 0
Myles' Cannel	23 6
Lochore Parrot (at Burntisland)	28 0
Lanemark (at Glasgow)	16 0
Elphinstone Tower (at Leith)	20 0
Coppa Cannel (on rail sat Birkenhd.)	14 9
Ditto ditto (ditto at Connah's Quay)	14 3

FREIGHTS.

Coastwise—Newcastle.—Per Ton:—

	£ s. d.
Chatham and Rochester	5 3
Cork	8 0
Dover, Folkestone, and Ramsgate	5 9
Dublin	9 0
Exeter Quay	8 6
Ipswich	4 6
London (from Leith)	8 0
London (Pool)	5 3
Lowestoft and Yarmouth	4 6
Portsmouth and Southampton	6 3
Plymouth	7s. 2d. to 7 9
Shoreham	6 0
Whitstable	5 6
Weymouth	7 0
Foreign.—Per Keel:—	£ s.
Barcelona	21 0
Bordeaux	12 0
Boulogne and Calais	£6 5s. to 6 10
Cadiz	11 10
Cronstadt	—
Copenhagen	8 5
Genoa	19 0
Hamburg	7 5
Havre de Grace	8 0
Leghorn	19 0
Lisbon	10 10
Rotterdam	6 15
Stettin	9 10
Trieste	18 0
Venice	20 0

SUNDRIES.

	£ s. d.
Best Newcastle Fire-bricks, per 1000	£2 10s. to 2 15 0
Cliff's Fire bricks (at Wortley), per 1000	2 15 6
Ingham's do. (at Wortley), p. 1000	2 15 0
Farnley Iron Co.'s Fire-bricks (at Wortley), less discount	2 17 0
Fire-clay Retorts, p. ft. run..5s. 6d. to	0 7 6
Tough Cake Copper, per ton	76 0 0
English Pig Lead, per ton	19 10 0
Welsh Bar Iron (in London), p. ton	6 10 0
Foreign Spelter, per ton	20 15 0
English Block Tin, per ton	133 0 0
Banca, per ton	138 0 0
Tarred Rope Yarn, p. cwt.	1 0 0

Advertisements.

PATENT IMPROVED

CAST-IRON CASED DRY GAS-METER

(*Drawings on application*).

FULLERTON, SON, & CO., ABBEY MOUNT WORKS, EDINBURGH.

Station-Meters and Gas Apparatus, Consumers Wet Gas-Meters in Cast-Iron, and Dry in Tin Plate Cases.

TO NOBLEMEN, GAS ENGINEERS, MANUFACTURERS, & OTHERS.

WANTED, by a respectable active middle-aged Man—a Plumber and Gas-Fitter, and who understands the fitting of hot-water apparatus—a Situation of Trust, or as Assistant Manager in a gas-work. Can produce 20 years testimonials.
Address E. C., Post-Office, Hythe, KENT.

WANTED, an active intelligent Man as TURNCOCK for the Newark Water-Works Company. He must be able to lay water-mains, attach services, do plumbers work, and thoroughly understand the management of water-works.
Apply, stating age, wages required, with other particulars, to Mr. NEWTON, Secretary, Water-Works Company, NEWARK.

WANTED, a situation as Gas-Meter INSPECTOR, by a young Man, aged 31. Has had seven years experience. Good references.
Address C. EDWARDS, care of S. Smith, Grocer, Highgate Buildings, Hunslet, near Leeds, YORKSHIRE.

WANTED, by the Shrewsbury Gas Company, an experienced GAS-FITTER, without family, to live at the Town Office. None need apply who are not steady and sober. Wages 20s. per week, house, coal, and gas.
Apply, in own handwriting, stating age and present employment, to S. B. DARWIN, Secretary and Manager.

TO GAS COMPANIES.

WANTED, by a practical Person, a situation as WORKING MANAGER, who can set clay or iron retorts, and thoroughly competent to manage a gas-work producing 12 millions per annum. Satisfactory reference.
Address A. G., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Foreign Gas Com- pany, a GAS-FITTER & BRASS FINISHER. One who understands retort-setting will be preferred. Terms liberal. Engagement five years. Passage out and home found.
Apply, by letter, to A. B., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER is open to a re- engagement as MANAGER, where the make is from 10 to 20 millions per annum. Is thoroughly practical. Undeniable references.
Address J. E., 29, Lillington Street, Pimlico, LONDON, S.W.

THE Directors of the Ulverston Water Company require a MANAGER, who will for a fixed payment per annum take entire charge of the works of the Company, and the repairs and renewals thereof, and the collection of rents of the Company.
The works are in a great measure undeveloped, and present a favourable opportunity for an enterprising young man with a practical knowledge of water-works, including practical pipe laying and fitting, as the Directors are prepared to give a handsome per centage on the increased rental, and to enter into an engagement for a term of years.
Particulars may be had on application to the Chairman, THOMAS ROPER, Esq., Gawithfield, ULVERSTON.

TENDER FOR GAS-WORKS.

TO BE LET, and entered upon from the 1st of July, 1869, for a term of Seven years, the GAS-WORKS situate at Battle, Sussex.
Sealed tenders to be sent to the Secretary of the Company, Mr. ROBERT FLINT, High Street, Battle, on the 30th of June inst.
The Company do not bind themselves to accept the highest or any tender.
This advertisement will not be repeated.
Battle, June 14, 1869.

PETERBOROUGH GAS COMPANY.

SURPLUS Plant for Sale.—Four 6-ft. square cast-iron Purifiers; Four 7-ft. square wrought-iron Purifiers; wrought-iron Sieves and Covers, and Lifting Apparatus complete; and 7-in. and 8-in. Connexions, with centre-valve. Also Four lengths 16-in. round Hydraulic Main, 11 H-Pipes, Six 18-in. Mouthpieces, Lids, and Screws; also several Valves.
For further particulars, apply to E. EVANS, Manager, at the Office, LONG CAUSEWAY.
June 16, 1869.

COTTON SEED PITCH.—For Sale, about 500 tons in casks.
Apply to EDWARD HALES, Esq., 35, Seething Lane, TOWER STREET.

TO BE SOLD.

THE Directors of the Elgin Gaslight Company, to make room for alterations in their works, offer FOR SALE 43 ft. of MAIN, 10 in. diameter, with 9 connexions, including mouthpieces, &c., and Four PURIFIERS, 4 ft. square, wrought, with a change valve.
For further particulars apply to ANDREW DOUGALL, Manager.
Gas-Works, May 22, 1869.

IN CONSEQUENCE OF THE ENLARGEMENT OF THE WORKS,

THE Directors of the High Wycombe Gas Company have FOR SALE a set of Three cast-iron dry-lime Purifiers, 6 ft. by 5 ft. 9 in. by 2 ft. 10 in., with 6-in. connexions, &c.; 6-in. Governor, with connexions; Two Gasholders, each capable of containing 8400 cubic feet of gas; 12-in. Hydraulic Main and Ascension-Pipes; cast-iron Frames, Mouthpieces, &c., for Cliff's Ovens; and a small Scrubber.
For further particulars apply to Mr. W. A. PADFIELD, Manager and Secretary, Gas-Works, HIGH WYCOMBE.

TENDERS FOR GAS COAL.

THE Directors of the Commercial Gas Company will meet on Friday, the 9th day of July next, to receive TENDERS for the supply of 53,000 tons, or a less quantity, of the best GAS COAL.
Particulars can be obtained by letter to the Company's Engineer.
Tenders to be addressed to the Secretary, and endorsed "Tender for Coal," to be delivered at the Company's Office before Ten o'clock on the 9th of July next.
The Directors do not bind themselves to accept the lowest or any tender.
By order of the Directors,
GEORGE JAQUES, Secretary.
Stepney, London, June 12, 1869.

HYDRAULIC Chandeliers, 4 and 3 light. First-class make, and in good repair.
3 and 2 light Stiff PENDANTS, 1¼ in. and 1 in., about 4 ft. 6 in. long.
To be seen at PRIDDY'S, Drapers, STRATFORD-BY-BOW.

STRAND UNION NEW WORKHOUSE, AT EDMONTON.

TO GAS ENGINEERS.

THE Guardians are willing to receive Proposals, accompanied by Tenders, for lighting the above Buildings.
The plans of the Buildings may be seen, and other particulars obtained, upon application to W. S. Cross, Esq., Architect, 14, Strand, W.C.
The proposals to be delivered at 6, Bow Street, on or before Monday, the 5th day of July next.
The Guardians do not bind themselves to accept the lowest or any tender.
Persons whose proposals are entertained will be subsequently communicated with by letter.
By order,
June 16, 1869. JAMES KILNER, Clerk.

ON SALE, at the New Mills Gas- Works, near Stockport, a STATION-METER, 4 ft. 8 in. by 3 ft. 8 in., with valves, 6-in. connexions, and by-pass. Is in good condition, and is being sold to make room for a larger. Price £30 as it stands.
May be seen by applying at the WORKS.

TO BE SOLD, for £25, One Purifier, 5 ft. by 3 ft. 6 in. by 2 ft. 6 in. deep, and Four 6-in. Walkers SLIDE-VALVES, as good as new.
Apply to R. DARNEY, jun., Secretary, Gas-Works, WHITSTABLE.

LEEDS CORPORATION WATER-WORKS.

WASHBURN SUPPLY.—CONTRACT No. 2.
TO CONTRACTORS FOR RESERVOIRS.

THE Corporation of the borough of Leeds are prepared to receive TENDERS for the construction of the Lindley Wood Storeage Reservoir, together with the diversions of roads and other works connected therewith, to be situate in the parishes of Otley and Fewston, in the West Riding of the county of York, and mainly at a distance of about 13 miles from the town of Leeds, and of about 3 miles from the Otley Station of the North-Eastern Railway.
Drawings and specifications may be inspected, and forms of tender and schedules of quantities may be obtained (on payment of five guineas for each set), at the Offices of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W.; and at the Office of Mr. Edward Filliter, Civil Engineer, 16, East Parade, Leeds, on and after Monday, the 14th day of June next.
Tenders must be delivered at the Town-Hall, Leeds, on or before Wednesday, the 14th day of July next.
The Corporation do not pledge themselves to accept the lowest or other tender.—By order,
C. A. CURWOOD, Town-Clerk.
Town-Hall, Leeds, May 29, 1869.
NOTE.—The earthwork in the embankment of the Reservoir will probably amount to 200,000 cubic yards or upwards.
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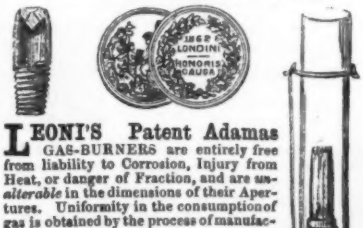

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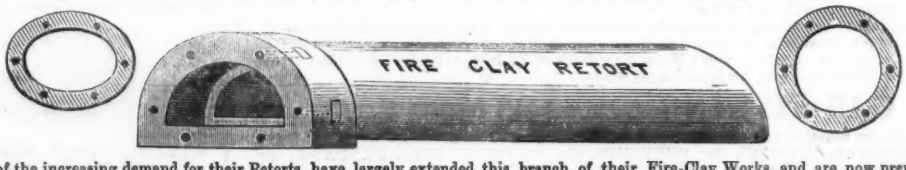

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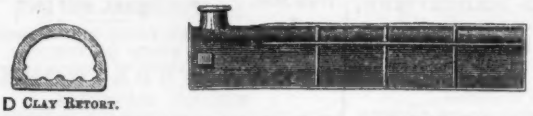

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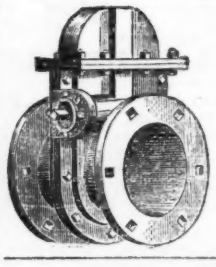

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These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.

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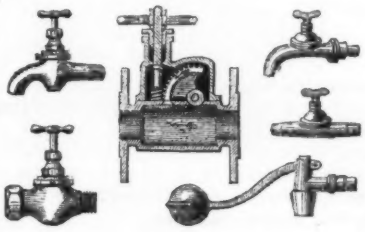

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Extract from Report by Dr. Letheby:—

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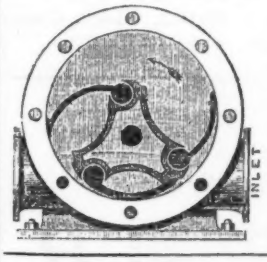

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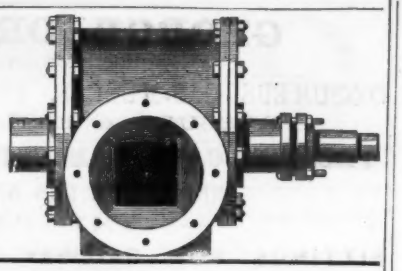

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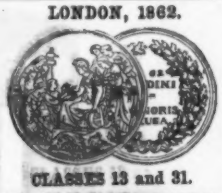

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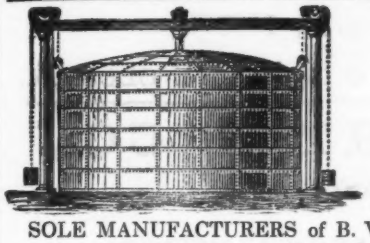

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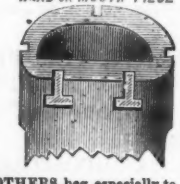

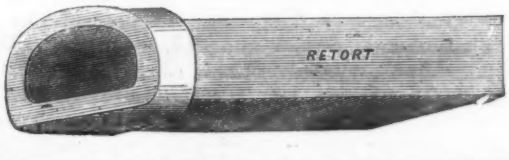

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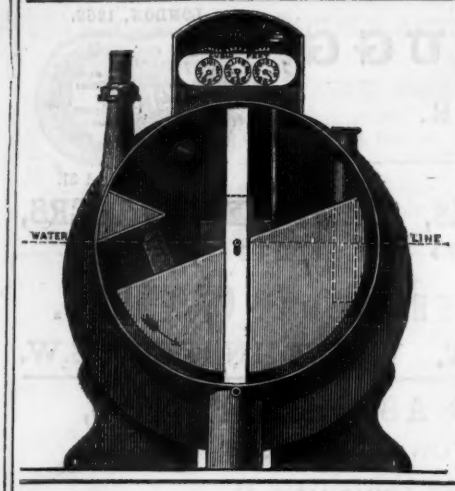

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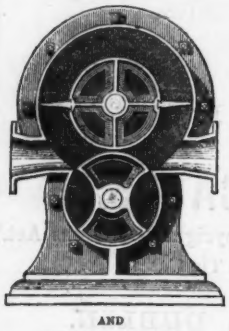

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